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Skeptical Inquirer

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KIMBALL C. ATWOOD IV

BACTERIA and ULCERS: Observing Science in Action

A Visit to a Creationist Theme Park

Explaining the Plagues of Egypt

Is Science Making Us Ignorant?

Defining Science: SETI vs. UFOlogy

Blind Spots, Brain Maps, and Backaches

Published by the Committee for the Scientific Investigation of Claims of the Paranormal

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EDITOR'S NOTE

The Path to Discovery and the Impact on Culture

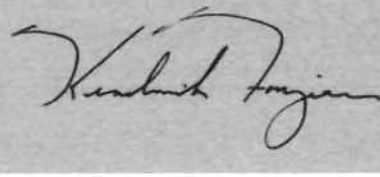
It wasn't an earth-shaking discovery. It didn't fundamentally revamp our cultural and cosmological worldview. But it was a fairly surprising one. The revelation that a microbe, *H. pylori*, is the cause of peptic ulcer disease seemed so counterintuitive to many that a myth has quietly grown up that the scientific establishment dogmatically resisted and delayed acceptance of the hypothesis. Is that true?

In a revealing case study in the recent history of science, Kimball C. Atwood IV, an anesthesiologist and assistant clinical professor of medicine, takes a deeper look at exactly how the hypothesis developed and made its way through the many steps that constitute acceptance of a new scientific idea. He describes the complexity of demonstrating that a microbe is the cause of a specific disease and the legitimate scientific and medical reasons the *H. pylori* hypothesis was subjected to (normal) scientific scrutiny. His conclusion? He shows that the hypothesis, far from being ignored, caused a scientific stir from the very beginning. Independent clinical studies had to be carried out, and they take time. All in all, Atwood finds, the whole process from start to finish took eight to ten years (depending on whether you define the end point as 1992 or 1994). The journey of the *H. pylori* hypothesis from proposal to acceptance "was quite ordinary." He finds, in fact, "the hypothesis was accepted right on schedule."

This kind of examination is interesting in itself, but it carries some lessons about the processes of science. The steps may seem slow in hindsight, but seldom are major scientific advances achieved overnight. And what is sometimes perceived as closed-minded resistance is in fact more often than not the normal careful workings of scientists methodically doing their job of ensuring that new claims are validated.

* * *

Scientific discoveries that *do* shake our worldview, however, seem to come along more often than we sometimes want. Sometimes it seems as though the more we learn about ourselves and the rest of nature the less we really understand. Often, as Austin Dacey writes in this issue, the latest science makes it the case that we no longer understand what we once did (or thought we did). As he says, emerging science speaks to central cultural questions, "but precisely what it says is unclear." He gives some examples in regard to our understanding of the self. But these unsettlements of our understanding provide an opportunity and need for a new multidisciplinary academic field—"science and the public," he and others are calling it—"with tremendous intellectual and social significance." Needed is a new appreciation of the scientific outlook, one that brings humanistic qualities as well as scientific or mechanistic attributes to bear, and linking with cultural beliefs and values. He describes how the Center for Inquiry, which houses CSICOP and the SKEPTICAL INQUIRER, is working to pioneer this activity.



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Russian Reports Add New Twist to Old Tunguska UFO Myth

JAMES OBERG

A flurry of reports from Russia this summer about the discovery of fragments of an alien spaceship at the site of the 1908 Tunguska explosion may be nothing more than wish fulfillment by devotees of a half-century-old Russian space myth, or they may actually have been based on genuine spacecraft fragments—but of Russian origin.

Either way, or even in the highly unlikely event the reports turn out to be credible, these stories reflect the way the century-old Tunguska blast continues to resonate in the human psyche.

Expedition leader Yuri Lavbin prefers the alien technology interpretation. That's the theory he admits he started with, even before he got to the area. But other space experts have pointed out that the region is a drop zone for discarded rocket stages launched into space from Russia's Baikonur base, and in fact was the crash site of one prototype manned space capsule at the very dawn of the space age.

On June 30, 1908, residents of southern Siberia spotted a dazzling fireball crossing the sky, followed by a flare brighter than the sun. Minutes later, a shock wave knocked many of those residents off their feet. When later expeditions reached the nearly inaccessible swamps where the explosion had occurred, they found trees flattened down in a pattern pointing away from ground zero—but no crater, and no meteorite fragments.

The first Soviet expedition was sent to the site in 1927, in hopes of finding metallic ore. Although a series of natural theories followed over the years, a Russian scientist and science-fiction author who visited Hiroshima in late 1945 postulated that the Tunguska blast, too, must have been nuclear in nature—and hence, the result of a visit by space aliens.

But Dutch space historian Geert Sassen suggests an earthly origin for the space fragments reportedly just found, and they could well have no connection with the 1908 event. "They might have found some parts of the fifth Vostok test flight," he told associates via e-mail.

Sassen was referring to a flight on December 22, 1960, meant to carry two dogs into space. According to *Challenge to Apollo*, NASA's definitive history of the space race, "the payload landed about 3,500 kilometers downrange from the launch site in one of the most remote and inaccessible areas of Siberia, in the region of the Podkamennaya Tunguska River close to the impact point of the famed Tunguska meteorite."

Expedition leader Yuri Lavbin and his "fragment" from the 1908 Tunguska explosion.

A team of space engineers located the capsule, disarmed the destruct system, and rescued the canine passengers. (See www.svengrahn.pp.se/histind/sputnik6/sputnik6.html.)

Initially, astronomers were attracted to the idea that the object had been a comet nucleus, to account for the explosion when it slammed into the atmosphere. They toyed with other theories, including proposals involving antimatter and "mini-black holes," but for many years there were no reliable theories on what happens when large objects hit Earth's atmosphere.

That changed in the 1980s, as observations of artificial and natural fireballs expanded, along with the development of computer simulations.

"When the first modern models for atmospheric impacts were published in 1993," NASA asteroid expert David Morrison said, "it became clear that this was a stony body." He suggested that it was "somewhere between an ordinary chondrite and a carbonaceous chondrite in physical properties."

It couldn't have been a "dirty snowball"—that is, a light, fluffy comet, he continued. "In contrast, cometary objects with this mass, of low density and/or icy composition, would explode tens of kilometers above the surface and cause no harm." We know this now because Pentagon satellites have actually been observing such explosions for several decades.

Unfortunately, Morrison adds, "the old comet theory persists out of inertia." As to current scientific thinking, he says "Tunguska was very likely a stony object about 60 meters [196 feet] in diameter that disintegrated explosively at an altitude of approximately 8 kilometers [5 miles]."

It didn't do the new Russian UFO story's credibility much good that it first appeared on the pages of the newspaper *Pravda* on August 10. In Soviet days, *Pravda* was the propaganda arm of the Soviet Communist Party, but under new management, it became a tabloid-style scandal sheet with a special penchant for wild paranormal tales. "Explorers believe they have discovered blocks of an extraterrestrial technical device," the article stated, adding that they assumed it was the one that had crashed in 1908. After dismissing a century's worth of scientific investigation into natural theories for the H-bomb-sized explosion, the article concluded: "The only real explanation can be linked with powerful electromagnetic phenomena," presumably of artificial origin.

Yuri Lavbin told journalists that his team had concluded that the object moved from west to east, not from southeast, on its approach to the explosion zone. Using satellite photographs, he identified search areas near the town of Poligus, and that is where he located the metal fragment.

Lavbin reported that he knew all along that the crash had been caused by a UFO, and that his expedition had been organized to find the proof. In his scenario, there was a natural object that threatened to destroy Earth, but aliens intervened to save our planet. "I am fully confident and I can make an official statement that we were saved by some forces of a superior civilization," he explained. "They exploded this enormous meteorite that headed toward us with enormous speed." Photographs of the fragments, as well as the results of laboratory testing, may become available in the near future. This would help differentiate something truly alien from the space debris that the Russians have been scattering across the Tunguska region for the last fifty years.

Sassen's suggestion that the mysterious "space fragment" found in the Tunguska area is more likely to be of Russian origin than Martian origin is supported by decades of history during which the Soviet government tolerated public interest in UFOs as a way of camouflaging actual space and missile events. Many of the most famous Soviet UFO stories that are still promoted in Western books and on Web sites have been traced back to original—but highly classified—military space missions.

The most spectacular Soviet "UFO wave" in history occurred over the southern part of the country in 1967 and 1968, when crescent-shaped giant spaceships were reported flying across the skies. Endorsed as "unexplainable" by top Russian scientists, the widely witnessed apparitions turned out to be secret tests of Soviet thermonuclear warheads diving back from orbit. In 1978, the smoking gun of Soviet UFOlogy was a "jellyfish" UFO that drifted through the skies of northwest Russia, zapping computers and panicking predawn witnesses. It turned out to be the contrails from a rocket carrying a spy satellite from a secret space base. A similar secret launch in September 1984, seen by the crews and passengers of several commercial airliners, sparked stories of death rays and alien attacks.

At the time, Moscow officials denied that such space and missile events were occurring—and some were borderline violations of arms control treaties. Thus, it was convenient to have an explanation for ordinary people who saw them in the skies and wondered what they could have been. So for a generation of Russians, "alien visitors" became the explanation of choice for unusual lights in the sky.

CSICOP Fellow and NBC News space analyst James Oberg spent twenty-two years at NASA's Johnson Space Center as a Mission Control operator and an orbital designer. He is the author of several books on UFOs as well as the Soviet space effort, including UFOs and Outer Space Mysteries *and* Uncovering Soviet Disasters.

French Group Tests Man's Claims to Sense a Person's Presence

Controlled, double-blind tests of a therapeutic touch practitioner's claims to be able to feel a "signal" or "fluid" in a person he is standing near have been carried out in France. To the man's surprise, but not that of the group conducting the tests, he failed to demonstrate the claimed ability.

The tests were conducted by the Observatoire Zététique, a nonprofit organization made of French skeptics. A "Mr. Z" contacted the group in June 2003 to establish a serious experimental protocol for a test or demonstration of his abilities. He explained that in his practice of touch therapy with patients, he feels a "signal" or "fluid" with his hands. He sought help in measuring the signal. From initial contact to final protocol, the test took nearly a year to come to fruition.

Several constant parameters about his practice were eventually established: the signal was perceptible through clothing, the signal's location remains stable with respect to a single patient for up to an hour or more, and the signal does not leave any "magnetic imprint" on the massage table.

Through discussions with Mr. Z it was agreed that a specific hypothesis would be tested: "In a double-blind setting, the therapeutic touch practitioner is able to determine the presence or absence of a patient provided that he has previously identified, in terms of strength and location, the signal emitted by such patient."

A therapeutic touch practitioner tries to sense a volunteer during a preliminary test by French skeptics. An opaque cloth covered the screen during formal tests.

A preliminary experiment with nine patients failed to demonstrate his abilities, but Mr. Z was determined to continue with the formal test plan, with the intention of seeing the test results published. Six months later, on May 17, 2004, everyone gathered at a location in the French Alps for the actual randomized, double-blind experiment.

Mr. Z selected the test "subject" from the seven members of the Observatoire Zététique group, after checking the quality of the signal he said each emitted. He also was allowed to select two examiners and an assistant.

The test protocol was again clearly described. Mr. Z would try to determine the presence of the test subject behind a folding screen covered by an opaque cloth. A total of 100 attempts would be undertaken, 50 with her present and 50 with her absent. The number of successful "hits" by Mr. Z would have to exceed 65 in order to be deemed statistically significant. Dry-run tests satisfied him that he could confirm the presence of the fluid. With movement of his hands back and forth he confirmed that he was receiving the signal clearly, without any alteration.

Noise-attenuating ear muffs were placed on Mr. Z and his two examiners, and once more he confirmed he detected the signal.

A randomized drawing was carried out to determine whether the test subject would place herself up against the screen or not. Mr. Z and his two examiners stayed in an isolated room while the test subject positioned herself (or not). They then entered and moved to the screen. Mr. Z was given as much time as needed to test the presence of a signal. A thumbs up from him indicated he detected it, a "zero" gesture indicated "no signal." Each examiner independently noted his result. Mr. Z and the examiners then returned to the isolated room, and the second attempt began. These steps were repeated until 100 attempts were obtained.

The data were then verified. Two tries were invalidated because a pre-drawn sheet by the assistant didn't correspond to the positions noted by the subject. The minimum number of hits for the experiment to be considered a success was recalculated at 64 (recalculated range of chance expectation: $34.19 < 49 < 63.85$). The results were then disclosed.

Out of 98 valid attempts, Mr. Z had been successful in 55 and failed in 43. Conclusion: "The experiment did not yield a statistically significant result: failure."

Nicolas Vivant, a member of the French group, provided the test report to the SKEPTICAL INQUIRER. A pdf version of the report is available at www.observatoire-zetetique.org/divers/oz-tt2004.pdf.

"Upon [the experiment's] conclusion," says the report, "the satisfaction of having implemented a complete protocol is tinged with sadness. The protocol's results, however, can be added to a succession of experiments that, since the eighteenth century, have never yielded a positive result. Accordingly, we can hardly claim to be surprised."

They complimented Mr. Z on his courtesy, passion, sincerity, and honesty. "His surprise then, comes on top of disappointment."

Professor Henri Broch of the University of Nice, the chief promoter of skeptical research in France, expressed a similar sentiment. He told the group, "Regarding your testing of the touch therapist, I feel sorry for him. . . ."

—Kendrick Frazier

Kendrick Frazier is editor of the SKEPTICAL INQUIRER.

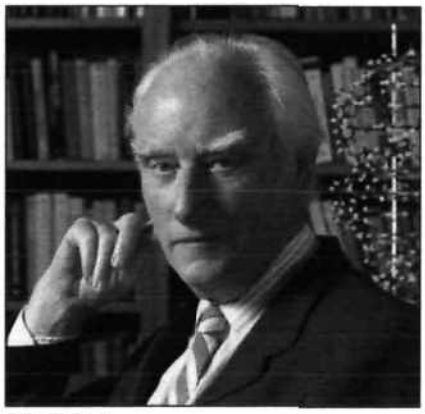
Nobelist Francis Crick, Stalwart Supporter of CSICOP and the Center for Inquiry, Mourned

We regret the passing of Francis Crick at the age of 88, after a long illness. Francis Harvey Compton Crick was born in England on June 8, 1916. He died on July 28, 2004, in San Diego, California, where he was affiliated with the Salk Institute.

Crick deplored the widespread scientific illiteracy and he believed that there needs to be some public appreciation of the scientific outlook and the methods of science. He was elected a Fellow of CSICOP in 1983 and a Humanist Laureate of the International Academy of Humanism in the same year.

Crick is widely recognized as one of the founders of modern molecular biology. He, along with James D. Watson, received the Nobel Prize in 1962 for the co-discovery of the structure of DNA. Indeed, many consider Crick to be *the* driving force in this research, its key intellectual leader. A whole line of crucial developments have already come out of this work—such as the Genome Project.

In his first book, *Molecules and Men* (1966, reissued by Prometheus Books in 2004), Crick raised the question of the demarcation line between "living" and "non-living" matter, a difficult issue to resolve, he wrote. He abandoned this quest and instead proposed to explain *all* biology in terms of physics and chemistry.



Francis Crick

He rejects what is known as "vitalism," the view that there is a "special force" directing the behavior and growth of living systems; or in recent years the reconsideration of "intelligent design." Crick was especially critical of religion as a substitute for science in explaining biological phenomena. He forcefully defended natural selection as a key concept in evolutionary biology, and he also rejected "the soul" or "consciousness" as immune to physical-chemical explanations.

Many observers believe that Crick's co-discovery of DNA's structure will be recognized as one of the greatest breakthroughs in science in the twentieth century, virtually equal to the work of Darwin and Mendel. The world has lost not only a great scientist, but a powerful voice on behalf of science.

—Paul Kurtz

Paul Kurtz is Chairman of the Committee for the Scientific Investigation of Claims of the Paranormal.

New Details Emerge About Psychic's Airline Bomb Threat Tip

As reported in the July/August issue of SKEPTICAL INQUIRER ("Psychic's False Bomb Tip Cancels Flight"), a self-described psychic suggested that a bomb was aboard an American Airlines flight in March 2004. Though the plane was searched and deemed safe, the flight was cancelled and travelers delayed. SI managing editor Benjamin Radford later contacted the officials involved to gain a better understanding of what happened and clarify the Transportation Security Administration's (TSA) position on the credibility of psychic information. After repeated queries, David M. Stone, Acting Administrator for the TSA, explained what happened: "American Airlines cancelled the flight from Fort Myers, Florida, to Dallas-Fort Worth, Texas, when the flight crew refused to fly. The flight crew apparently became concerned after it learned that a call had been received from a psychic suggesting that a bomb may be onboard. Despite assurances from TSA officials at [the Florida airport] that the source was not credible and that a security sweep of the aircraft revealed no threat, the crew would not fly. Unfortunately, other crewmembers were not available in Fort Myers, and American Airlines subsequently cancelled the flight."

These never-before reported details provide insight into a case where psychic claims involve issues of national security. Contrary to previous reports, it was not the actions of the TSA that led to the flight's cancellation but instead a nervous American Airlines flight crew who refused to perform their duties. While the fact that the TSA found the psychic to be a "non-credible source" is encouraging, this case provides an interesting example of how a threat can be taken seriously by those of a superstitious or magical mindset. Even assurances that the psychic source was not credible and that the aircraft had been thoroughly searched were not enough to allay fears of legitimate psychic predictions.

Stone continued, "It is our policy to evaluate information provided from all sources in an attempt to either substantiate or refute the information provided. In this instance, the information proved to be from a non-credible source. However, TSA did conduct a security sweep of the aircraft to alleviate the concerns of the crew—unfortunately, to no avail. The criteria by which alleged threat information is evaluated are considered sensitive security information and may not be released to the public. TSA elected not to treat this report as a criminal bomb threat since the individual wanted to warn authorities. We have determined that no action should be taken against this individual."

While security threats from any source cannot be ignored, hopefully this incident will set a precedent in which psychics are known to be not only non-credible but in fact at times harmful, causing unnecessary fear, inconvenience, and delay.

—Benjamin Radford

Prayers, Psychics Fail to Find Missing Women

Prayers and psychics have failed to recover a Brigham Young University student who has been missing since May 24, 2004. On July 31, hundreds of people gathered at the Benton County Courthouse in Corvallis, Oregon, to pray for the safe return of Brooke Wilberger, who police believe was abducted.

Though the prayers have so far remained unanswered, other supernatural powers have also failed to locate or return the young woman: Police said they have received more than 500 tips from alleged psychics. Investigators have focused on several "people of interest" in the case, though as of this writing, no one has been charged in Wilberger's disappearance.

Psychics and prayers also failed to recover Lori Kay Hacking, another woman who disappeared in recent months. The pregnant Salt Lake City woman was last seen jogging on July 19, 2004; her husband has been charged with her murder. The search for Hacking was joined by the parents of Elizabeth Smart, who vanished from her home in 2002. After Smart was kidnapped, nearly a thousand psychics contacted the Smart family and police, offering their visions, information, and evidence. These tips, like all the rest, were investigated and followed up. Not a single piece of evidence from all those psychics led to the girl's recovery; instead, Smart was recognized by two alert couples in a Salt Lake City suburb.

Tragically, psychics have consistently failed to be of help in police investigations. They failed to locate missing University of North Dakota student Dru Sjodin after she disappeared from a shopping mall parking lot. Despite numerous prayer vigils and hundreds of tips from self-proclaimed psychics, Sjodin was never seen alive again and was only located by police after a five-month search. Sjodin's body was found in a ravine near a county road northwest of Crookston, Minnesota, on April 17, 2004.

—Benjamin Radford

Fortuneteller Allowed at Fair Despite Law

Loretta Adams, a self-described "psychic consultant," requested—but was denied—a permit to open a booth at the 2004 Kane County Fair in the city of St. Charles, near Chicago. In July of 2004, Chris Unger, executive manager of the fair, declined Adams's request because of an existing St. Charles ordinance that reads, "No person shall perform or practice within the city as a fortune-teller, clairvoyant, spirit medium, necromancer, seer, astrologist, palmist, prophet or in any other pretended art of telling past, present or future events of another's life or affairs,

to obtain money or property by fraudulent devices or practices."

Adams, after filing a lawsuit against the city of St. Charles, received a legal opinion from St. Charles attorney Timothy O'Neil that cleared the way for her prophecy-for-profit business. In a letter to Adams's lawyer, Kenneth Flaxman, O'Neil wrote, "I can unequivocally state it is not unlawful for your client to practice her profession."

Yet Adams's profession clearly violates the ordinance; apparently the clause under which O'Neil agreed that Adams would not be in violation of the ordinance is that of obtaining "money or property by fraudulent devices or practices." Psychic reading and fortune telling are practices for which no validity has been established; Adams makes her living charging money for services she cannot render. Adams's claim that she can discern a person's future would seem to be, until proven, a "fraudulent practice."

The case is not substantially different than that of, say, a psychic healer who might wish to open a booth at the fair. If the healer claimed to be able to cure diseases such as autism or cancer with his or her psychic powers, that would surely qualify as a fraudulent and deceptive claim. The claim is *prima facie* absurd: medical science has never shown that anyone has that ability. Similarly, Adams's claim that she can divine the future and tell fortunes for paying clients is entirely unsubstantiated.

O'Neil was sent a letter asking for clarification of his position that stated, in part, "As city attorney for St. Charles, it is your job to protect the public interest. . . . By affirming the legality of Ms. Adams's fortunetelling and psychic services, you seem to have clearly contravened both the letter and intent of the ordinance. The ordinance was created to protect citizens from exploitation by those who charge money for fortune telling services using abilities they claim to have but do not in fact possess."

In his response, O'Neil writes, ". . . the legal basis for my assertion that it is not unlawful for Ms. Adams to practice her profession. . . . is rampant in federal court decisions striking down similar ordinance[s] on First Amendment grounds. . . . the ordinance only makes the practice of fortunetelling unlawful when it is used to 'obtain money or property by fraudulent devices or practices.'" O'Neil adds, "Should Ms. Adams obtain money or property by fraudulent devices or practices, she will be prosecuted not only by the City of St. Charles but more than likely by the Kane County State's Attorney for criminal violation."

St. Charles is only one of many cities to uphold the rights of fortunetellers. In November 1999, a federal judge in New Iberia, Louisiana, struck down that city's 1982 ban on palm reading and fortune telling. Lawyers for New Iberia argued that the ban protected the welfare of its citizens by cracking down on fraud and unfair trade practices. Framing the fight as a free speech issue, Melissa Long, a fortuneteller, along with a psychic reader and help from the American Civil Liberties Union, sued the city. After the ruling Long commented that the decision was a "victory for free speech" that "brings New Iberia up to the times."

—Benjamin Radford

Well, Larry—You've Done It Again

Larry King's viewers must be getting tired of Sylvia Browne and John Edward having a monopoly on "communicating with the dead" on his show, so Larry's next alleged psychic to promote such a claim is Char Margolis, who appeared on CNN's *Larry King Live* July 9, 2004. The program represented, at minimum, the nineteenth time this decade an alleged psychic medium appeared as a guest on the show. She was originally scheduled to appear on Larry's July 2 show but was moved (which Char apparently couldn't foretell) because King's producers decided at the last minute to do a show on Marlon Brando's death that same day.

Skeptics are well aware of the personal-validation concept—whereby people receiving a psychic reading feel validated by being told apparently specific *information when, in actuality, general* predictions are made with the use of other "techniques" to increase the accuracy rate. Margolis's techniques include grossly stretching the pool of possible correct answers. Many alleged psychics gain an advantage this way by fishing for information—such as asking if the spirit to be contacted has a name beginning with the letter *M*, for example. Char not only doubles her chances of a hit by giving two letters, but she also says the person "coming through" can be deceased *or living*. She further increases the pool by posing her questions carefully: all the caller has to do is "know" any person connected to the letters, rather than the connection representing the specific spirit the caller is trying to reach. In addition, the caller has to be open-minded as to the gender of the spirit. There are plenty of fish in this tiny bowl.

Char Margolis

Here's a typical example of the kind of thing Margolis said first to a caller on that July 9 *Larry King Live* program, this caller being from Las Vegas: "Do you have somebody who's an 'A' or 'M' initial connected with you?" This could be male or female. Char, please—who doesn't?

Despite these shameful and obvious advantages, Char gave one of the worst

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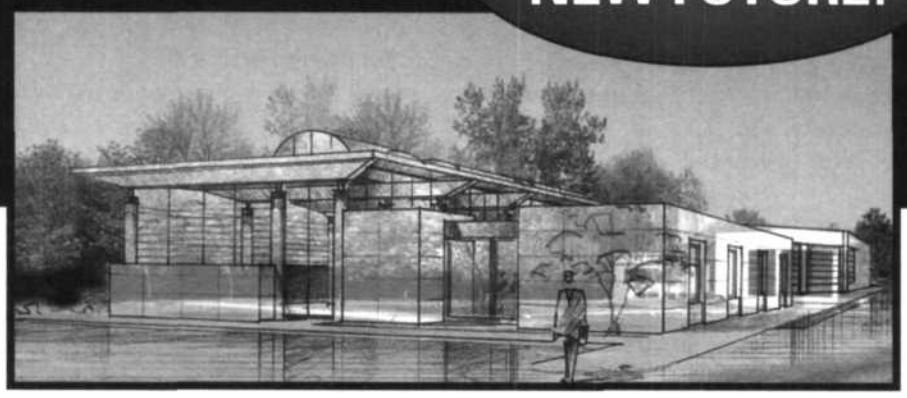
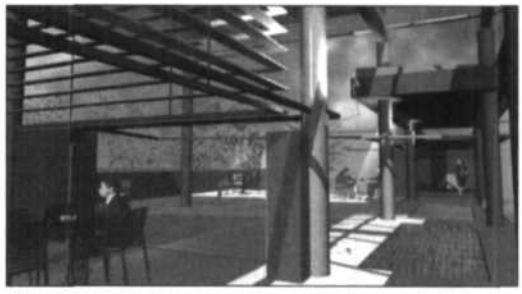


The Center for Inquiry – *Transnational* announces a major 13,600 square foot expansion at its Amherst, New York, headquarters. Slated for completion during 2005, the $2.54 million expansion will more than double conference and seminar capacity, add ten urgently-needed new offices, and enlarge the Center's world-class libraries. This capital project will relieve serious overcrowding and capacity problems, supporting projected program growth of the Center and its affiliate organizations, including the Committee for the Scientific Investigation of Claims of the Paranormal, for years to come.

We are bursting at the seams, and cannot continue program growth without expanding our headquarters. The shelf space of our skeptical and freethought library—the finest in the world—is full. Yet donated books, magazines, and archival materials keep coming. There's an office or workstation everywhere we can put one, yet program and staffing needs continue to grow. Our existing conference and seminar space, opened in 1995, is often overwhelmed by larger and more complex events.

The headquarters expansion is one focus of our $26.26 million New Future Fund capital campaign. Your gift to the New Future Fund today will help to make our desperately-needed headquarters expansion a reality. We seek gifts of cash, publicly-traded securities, paid-up insurance policies, and other assets. Attractive incentive and naming opportunities are offered in acknowledgment of larger gifts. All gifts are fully tax-deductible as provided by law. Please join us and declare your support. Write, call, email, or send the bound-in postcard today!

The new addition will be erected just east of the present building, constructed in 1995.

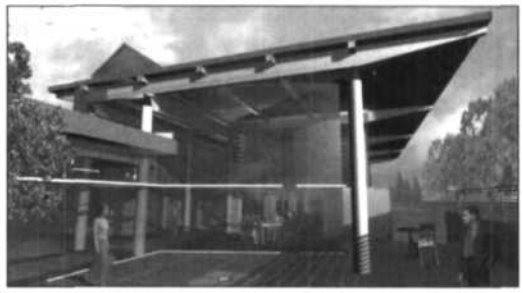


Three large seminar rooms open off of the new building's central corridor.

Center for Inquiry–*West*, Los Angeles

Center for Inquiry–*MetroNY*, at Rockefeller Center

Center for Inquiry–*Florida*, Tampa



Located between the current and new buildings, this Garden Patio will be an exciting focus for seminar meal breaks, media interviews, and other outdoor activities.

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performances of any psychic on *Larry King Live* in terms of accuracy. Time after time, callers would disconfirm a Margolis "insight." She explained her inaccuracies as "trickster energy." The trick is on the gullible viewer who thinks her hits are proof that she's blessed with supernatural ability. These are a modified version of the same old techniques used by Sylvia (and the others), only under the guise of a prettier face. Char Margolis says that our thoughts create reality. Hmmm. Well, Larry—you've done it again.

—Bryan Farha

Bryan Farha is a professor of behavioral studies in education at Oklahoma City University and a CSICOP scientific and technical consultant.

APS's Bob Park Elected a CSICOP Fellow

Physicist, educator, and writer Robert Park has been elected a Fellow of the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), publisher of the SKEPTICAL INQUIRER.

Park is professor of physics and former chairman of the Department of Physics at the University of Maryland and a long-time director of the Washington office of the American Physical Society, where he writes the electronic column "What's New." The widely read weekly column tracks and opines on current meanderings of Washington science and medical policy happenings, including frequent excesses or interactions involving alternative medicine, supposed energy generators that violate the laws of physics, and other fringe-science activities.

Park has even coined a word encompassing pathological science, junk science, pseudoscience, and fraudulent science—"voodoo science." That provided the title of his book on the subject, *Voodoo Science: The Road from Foolishness to Fraud*, published by Oxford University Press in 2000.

CSICOP Fellows are distinguished scholars, scientists, educators, or investigators who have made significant contributions to science and skepticism. Fellows are nominated and elected by the CSICOP Executive Council.

Psychic Sylvia Browne Once Failed to Foresee Her Own Criminal Conviction

Self-claimed "psychic, medium, clairvoyant, channel" Sylvia Browne has gained notoriety by appearing on *Montel Williams* and *Larry King Live* and by writing books that bill her as a "*New York Times* Bestselling Author." Not so well known, however, is that—before adding an *e* to her surname—Sylvia Celeste Brown was involved in selling securities to a gold-mining venture while failing to foresee the true consequences: the venture failed, and she and her estranged husband were subsequently indicted on several counts of investment fraud and grand theft.

The criminal complaint, filed in the Superior Court of Santa Clara County, California, on May 26, 1992, alleged that the Browns sold securities in the venture under false pretenses. Although telling a couple their $20,000 investment was to be used for immediate operating costs, the complaint stated, the Browns transferred the money to an account for their Nirvana Foundation for Psychic Research. Just one month later, in April 1988, the complaint stated, they declared bankruptcy in the venture.

Reporting on the pair's arraignment, the June 6, 1992, *San Francisco Chronicle* noted that "Sylvia Brown claimed to have strong psychic 'feelings' that the mine would pay off." (The *Chronicle* clipping resurfaced recently in a review of some old files, and investigator Vaughn Rees undertook the job of obtaining certified copies of the papers for criminal case #16303.)

The documents show that Sylvia and her estranged husband Kenzil Dalzell Brown pleaded no contest to a felony charge of "sale of security without permit," made restitution in the case, and received one year probation each. Dalzell's disposition included "County Jail *4 mos[.]* with credit for time served of *21 days*," while Sylvia's included 200 hours of community service.

In her book, *Adventures of a Psychic* (written with Antoinette May, 1998 ed.), Browne blames her 1988 bankruptcy declaration on her ex-husband's "attempt to hide his illegal doings," without mentioning her felony conviction in the gold-mine case. She laments that while "ignorant people" say, "Well, if you're so psychic, why didn't you . . . ," the answer, she says, is that "I am not psychic about myself." Frankly, one might not wish to buy that excuse, or much of anything else involving claimed psychic powers, from Sylvia Browne—with or without the *e*.

—Joe Nickell

Joe Nickell is CSICOP's Senior Research Fellow.

David Morrison Named 2004 Sagan Medalist

Space scientist David Morrison, a CSICOP Fellow, has been awarded the 2004 Sagan Medal by the American Astronomical Society's Division for Planetary Science.

The Sagan medal is the highest honor (for public outreach) awarded by the Division for Planetary Sciences. It is named for the late astronomer, author, and science popularizer Carl Sagan, who was Morrison's professor when Sagan was on the Harvard faculty.

Morrison is a planetary astronomer, author of numerous books on planetary science and missions, and senior scientist at NASA's Astrobiology Institute at the Ames Research Center in California. Among other things, he is an expert on near-earth asteroids and the threats they pose to our planet. □

Senate Intelligence Committee Highlights Need for Skeptical Inquiry

BENJAMIN RADFORD

On July 9, 2004, a bipartisan Senate Select Committee on Intelligence released the findings of its inquiry into America's prewar intelligence assessments on the military threat posed by Iraq.

The panel was formed in the wake of the September 11, 2001, attacks and the follow-up invasion of Iraq in search of terrorists. The committee and its report are remarkable. It was the largest single effort to analyze and quantify government intelligence failures in United States history. The kernel of the committee's findings: The information gathered by the most sophisticated intelligence community in the world was deeply flawed because of a lack of skepticism. Never has the need for skepticism been so explicitly called for by a high-profile government panel. It is possible that, had the principles espoused by CSICOP been practiced by the intelligence community, our country might have avoided a controversial and costly war.

Assertions were made by British and American government officials that Iraq's president Saddam Hussein posed a serious, credible, and immediate threat to America through programs developing weapons of mass destruction (WMD). Yet after invading Iraq and occupying the country for eighteen months, those weapons have not been found. Both governments argue that the WMD claims were incidental to the case for war and that the Iraq attack was nevertheless justified.

That issue aside, the fact remains that intelligence information provided to government officials, and in turn to American and British citizens, was incorrect. In July 2004, British Prime Minister Tony Blair admitted that Iraq may not in fact have had the WMDs when the war began: "I have to accept we have not found them, that we may not find them." Blair's doubt stands in sharp contrast to Secretary of State Colin Powell's address to the United Nations on February 5, 2003, in which he laid out the administration's case for war. In his speech, Powell stated his conclusions with certainty and authority: "My colleagues, every statement I make today is backed up by sources, solid sources. These are not assertions. What we're giving you are facts and conclusions based on solid intelligence."

The Select Committee found instead that "much of the information provided or cleared by the CIA for inclusion in Secretary Powell's speech was overstated, misleading, or incorrect." The committee found that many statements made by intelligence and administration officials overstated the accuracy and certainty of the underlying information. For example, "statements . . . that Iraq 'has chemical and biological weapons,' 'Iraq has maintained its chemical weapons effort,' and 'is reconstituting its nuclear weapons program,' did not accurately portray the uncertainty of the information."

The Senate and the American public were misled by administration officials; they, in turn, were misled by inaccurate information provided to them by a flawed intelligence community, which in turn was misled by Iraqi dissidents and others.

It is clear that the intelligence failures transcend politics and presidential administrations. The report found that "The failure of the intelligence community to accurately analyze and describe the intelligence . . . was the result of a combination of systemic weaknesses, primarily in analytic trade craft, compounded by a lack of information sharing, poor management, and inadequate intelligence collection. Many of these weaknesses . . . have not yet been fully addressed, despite having been identified previously by other inquiry panels."

The senate committee identified about a half dozen serious flaws and biases in the way that information crucial to national security and international policy was gathered and analyzed. The report "describes a variety of serious

Benjamin Radford is managing editor of the SKEPTICAL INQUIRER, Director of Publications at the Center for Inquiry–Transnational, and author of Media Mythmakers: How Journalists, Activists, and Advertisers Mislead Us *(Prometheus 2003).*

analytical and collection failures in the intelligence community's work."

The major findings follow, taken from the report's conclusions.

1) Reliance on indirect, second-, or third-hand information from uncertain sources.

Intelligence information was often presented as having been gathered by first-hand, knowledgeable sources when in fact the data relied on indirect reporting and older assessments. In the case of Iraq, the committee found:

> The Intelligence Community (IC) did not have a single HUMINT source [spy] collecting against Iraq's weapons of mass destruction programs in Iraq after 1998. . . . The IC relies too heavily on foreign government services and third party reporting, thereby increasing the potential for manipulation of U.S. policy by foreign interests. . . . These indirect sources left the IC with few ways to determine the exact nature of suspicious Iraqi activity. The expectation, however, that Iraq would take advantage of the departure of inspectors to resume and expand its WMD programs led analysts to downplay or ignore the increased uncertainty that came with these less detailed and less reliable sources.

In other cases, the panel concluded, the true source of intelligence information was deliberately obscured, thus rendering the credibility of that information unknowable. The Central Intelligence Agency, for example, "withheld important information concerning [an informant's] reliability [from data analysts]. . . ."

The issue of source concealment was also evident in Secretary Powell's presentation. Powell's information was discovered to have relied significantly upon an intelligence dossier prepared by the British government titled "Iraq: Its Infrastructure of Concealment, Deception, and Intimidation." That report was in turn drawn not from the best information available to MI-5 (Military Intelligence Department 5, Britain's intelligence organization) but instead was heavily plagiarized from a California graduate student's outdated college essay.

2) Adoption of a "group think" mentality that discouraged analysts from independent or unpopular thinking.

Many of the intelligence failures *stemmed from a lack of independent* thinking and an inability or unwillingness to question authority and assumptions. In particular, the term *group think* (exemplified by examining few alternatives, selective gathering of information, pressure to conform within the group or withhold criticism, and collective rationalization) was repeatedly used to describe the intelligence atmosphere:

> This "group think" dynamic led Intelligence Community analysts, collectors, and managers to both interpret ambiguous evidence as conclusively indicative of a WMD program as well as ignore or minimize evidence that Iraq did not have active and expanding weapons of mass destruction programs. This presumption was so strong that formalized mechanisms ["red teams," "devil's advocacy," and other types of alternative or competitive analysis] established to challenge assumptions and group think were not utilized. . . . The Committee found no evidence that IC analysts, collectors, or managers made any effort to question the fundamental assumptions.

This lack of skepticism was not limited to the ground-level intelligence collectors and analysts: "Managers . . . did not encourage analysts to challenge their assumptions, fully consider alternative arguments, accurately characterize the intelligence reporting, or counsel analysts who lost their objectivity."

3) Interpreting ambiguous evidence according to preconceived notions; seeking only confirming evidence and discounting contradictory evidence.

As reported in SKEPTICAL INQUIRER several months ago ("Reports: Policy, Not Science, Drives Bush Administration," SI May/June 2004), intelligence officers and government officials had an answer in search of evidence, not evidence in search of an answer. "Analysts interpreted ambiguous data as indicative of the active and expanded WMD effort they expected to see. The presumption that Iraq would take advantage of the departure of inspectors to restart its WMD efforts essentially became a hypothesis in search of evidence."

The committee found that analysts "*had a tendency to accept information* which supported [their presumptions] . . . more readily than information which contradicted" them. The committee concluded that this bias was endemic and entrenched in the intelligence community, which "has long struggled with the need for analysts to overcome analytic biases, that is, to resist the tendency to see what they would expect to see in the intelligence reporting. In the case of Iraq's weapons of mass destruction capabilities, the committee found that intelligence analysts, in many cases, based their analysis more on their expectations than on an objective evaluation of the information in the intelligence reporting." The panel went on to report:

> The CIA tended to discount human intelligence sources that denied the existence of Iraqi WMD programs as just repeating the Iraqi party line. In fact, numerous interviews with intelligence analysts and documents provided to the Committee indicate that analysts and collectors assumed that sources who denied the existence or continuation of WMD programs and stocks were either lying or not knowledgeable about Iraq's programs, while those sources who reported ongoing WMD activities were seen as having provided valuable information.

The committee report singled out the CIA in particular for its agenda-driven investigation, finding that

> The agency's initial reporting on its aluminum tube spin tests was, at a minimum, misleading and, in some cases, incorrect. . . . In some cases CIA analysts were not open to fully considering information and opinions from other intelligence analysts or creating a level playing field in which outside analysts fully participated in meetings or analytic efforts. This problem was particularly evident in the case of the CIA's analysis of Iraq's procurement of aluminum tubes during which the Committee believes the agency lost objectivity and in several cases took action that improperly excluded useful expertise

from the intelligence debate. For example, the CIA performed testing of the tubes without inviting experts from the Department of Energy (DOE) to participate. A CIA analyst told Committee staff that the DOE was not invited 'because we funded it. It was our testing. We were trying to prove some things that we wanted to prove with the testing. It wasn't a joint effort.' The Committee believes that such an effort should never have been intended to prove what the CIA wanted to prove, but should have been a Community effort to get to the truth about Iraq's intended use for the tubes. . . . In another instance, an independent Department of Defense rocket expert told the Committee that he did not think the CIA analysts came to him for an objective opinion, but were trying "to encourage us to come up with [the] answer" that the tubes were not intended to be used for a rocket program.

The report also found that "The IC's failure to find unambiguous intelligence reporting of Iraqi WMD activities should have encouraged analysts to question their presumption that Iraq had WMD. Instead, analysts rationalized the lack of evidence as the result of 'vigorous' Iraqi denial and deception efforts to hide the WMD programs that analysts were certain existed." SKEPTICAL INQUIRER readers familiar with the history of satanic cult conspiracies of the 1980s and 1990s may find this example familiar. For zealous investigators operating on surety instead of science, the total lack of evidence for cult activities was itself evidence of a well-organized and powerful group.

4) Basing judgments on previous assessments instead of new information, while failing to question underlying assumptions and omitting caveats.

The committee also found that "In a few significant instances, the analysis . . . suffers from a 'layering' effect whereby assessments were built based on previous judgments without carrying forward the uncertainties of the underlying judgments [and] substantial new intelligence reporting. . . ." For example, this layering effect occurred in the analysis of Iraq's chemical weapons program:

> The National Intelligence Estimate stated that Iraq had renewed production of chemical weapons agents and stockpiled as much as 500 metric tons of chemical agent, much of it added in the last year. These assessments were largely based on another assessment, that Iraq may have been engaged in chemical weapons transshipment activity in the spring of 2002. This assessment was largely based on yet another assessment, that the presence of a specific tanker truck was a possible indicator that chemical or biological weapons related activities were occurring. The IC did not make it clear in its latter assessments that its judgments were based on layer upon layer of previous analytic judgments.

Good decisions, whether of personal or global importance, demand valid information. The same principles of rational inquiry used in science to distinguish truth from error and fact from supposition can guide public policy. The Senate report shows that skepticism can be—and must be—applied to issues of social and national importance. American intelligence agencies are currently undergoing the most drastic overhaul in our country's history. America's security may very well depend on how receptive our intelligence community is to the Senate committee's call for skepticism.□

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Skeptical Inquirer

For more information, contact Barry Karr, Executive Director of CSICOP, at **716-636-1425**. All inquiries are held in the strictest confidence.

CSICOP

Rorschach Icons

People arrive in droves to view them: holy images that appear—many believe miraculously—in the most unlikely places. They include the figure of the Virgin Mary formed by a stain on a store's bathroom floor, the face of Jesus in a giant forkful of spaghetti illustrated on a billboard, and the likeness of Mother Theresa on a cinnamon bun served in a coffee shop (Nickell 1997, 1998).

Simulacra

Such images are frequently reported. If the depictions are of religious figures, they are sometimes popularly termed "apparitions" or "religious visions" (e.g., Virgin Mary 2003). However, they are quite different from the internalized viewings by "visionaries" which typically are unseen by ordinary folk. Rather, they are more or less visible to everyone, representing simply the ink-blot or picture-in-the-clouds effect: the mind's tendency to "recognize" pictures in random patterns.

This tendency is known as *pareidolia*, a neurological/psychological phenomenon by which the brain interprets vague images as specific ones. These are known as *simulacra* (DeAngelis 1999; Novella 2001). Often the discerned image is a face because—as Carl Sagan (1995, 47) explained, "As soon as the infant can see, it recognizes faces, and we now know that this skill is hardwired to our brains." As Sagan observed (1995, 46):

> The most common image is the Man in the Moon. Of course, it doesn't really look like a man. Its features are lopsided, warped, drooping. There's a beefsteak or something over the left eye. And what expression does the mouth convey? An "O" of surprise? A hint of sadness, even lamentation? Doleful recognition of the traits of life on Earth? Certainly the face is too round. The ears are missing. I guess he's bald on top. Nevertheless, every time I look at it, I see a human face.

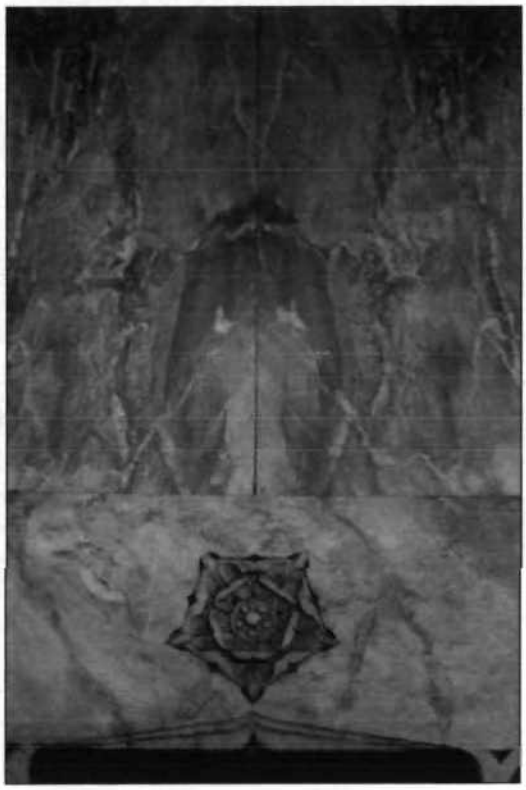

Figure 1. In the sanctuary of St. Bartholomew's Church in Manhattan, a figure of Jesus emerging from his tomb has been divined in the patterned marble.

Other secular simulacra include the "Face on Mars" (see Morrison 1988), as well as various shapes—a camel, butterfly, and a portrait of comedian Bob Hope—in a woman's potato chip collection (Nickell 1998, 137). One famous granite formation, New Hampshire's the Old Man of the Mountains profile, was a 700-ton, 1,200-foot-high simulacrum until it collapsed into rubble (Laughlin 2003).

Of course, simulacra can be faked. For example, suspect, crudely artistic images appeared repeatedly on the floor of a peasant woman's home in Belmez de la Moraleda, Spain, in 1972 (Nickell 1998, 39). A large Christ portrait—looking amateurishly airbrushed, complete with a neat, oval-ringed halo—supposedly formed "miraculously" in 2000 on the wall of Palma Sola Presbyterian Church in Bradenton, Florida (Christ 2000). It appeared after workers used *pressurized jets of water* to clean the bricks. Deliberate simulacra hoaxing, however, seems rare.

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Pious Imagination

Not surprisingly, a great number of reported simulacra are religious. For example, a Moslem girl in England reportedly found an Arabic message, "There is only one God" in the seed pattern of a sliced tomato (Message 1997).

Religious simulacra are perhaps most often associated with Catholic or Orthodox tradition, wherein there is a special emphasis on icons and other holy images. (Historically, what were perceived as excesses of image veneration were felt to represent idolatry, a violation of the commandment against graven images. Such objections led to the iconoclastic crisis in the Byzantine empire, 724–843 A.D., and were among the issues of the Protestant Reformation.) (Eliade 1995; Nickell 1997)

Today, theologians and clerics are usually quick to dismiss such images, one priest wisely attributing them to "pious imagination" (Nickell 1998, 34). However, they remain intensely popular among the superstitious faithful, and another priest, while warning against image worship, says more hopefully that simulacra created by nature "can provide us with a mirror into the transcendence of something larger than ourselves" (Cox 2001).

Images of Mary are especially prevalent, appearing in a splotch of tree fungus in Los Angeles, a fence post in Sydney, Australia, a tree stump and a refrigerator door in New Jersey, a mottled rust stain on a water heater in Arizona, a bedroom wall in Nova Scotia, the bark of an elm tree in Texas, and so on—as shown by clippings in my bulging "simulacra" file (e.g., Virgin Mary 2003). One of my favorites is the form of the Virgin of Guadalupe in spilled ice cream (Stack 2000).

Images of Jesus are also frequently perceived—for example, in the foliage of a vine-covered tree in West Virginia, in rust stains on a 40-foot-high soybean oil tank in Ohio, a grimy window in an Italian village, and in the discoloration of a San Antonio living-room ceiling, among numerous such examples. In 1995, television viewers saw the face of Jesus in a photo taken by the Hubble Space Telescope, showing stars being born in a gas cloud some six trillion miles long (Nickell 1997, 5). A Sacred-Heart figure of Jesus (as well as an Easter bunny) is outlined in the woodgrain pattern of my office door.

St. Bartholomew's

Religious simulacra have been sighted since at least the third century A.D. (Rogo 1982, 113). In 1932, one "suddenly appeared" on a wall inside St. Bartholomew's Church in Manhattan (Hauck 1996).

Actually it was suddenly discerned. The rector of the Episcopal church, the Reverend Dr. Robert Norwood, had just concluded a Lenten sermon, titled "The Mystery of Incarnation." As he stated:

> . . . I happened to glance at the sanctuary wall and was amazed to see this lovely figure of Christ in the marble. I had never noticed it before. As it seemed to me to be an actual expression on the face of the marble of what I was preaching, "His Glorious Body," I consider it a curious and beautiful happening. (Calkins 1982)

The figure was described as about one and a half feet tall, delineated in the variegations of the sepia marble directly above the door of the sanctuary. Armed with Rev. Norwood's description, colleague Austin Dacey and I visited St. Bart's in search of the image. Few there had heard of it except Becca Earley, who trains the church's tour guides. She did not know the exact location, but over the years had discovered multiple simulacra—various faces and figures—in the sanctuary's expanse of marble. She termed it "one enormous slab of Rorschachs" (Earley 2003).

Using the published description, we quickly found the image which—to the imagination—could seem to be that of a white-robed figure emerging from a tomb (figure 1). Seemingly unaware of the simulacra phenomenon, Rev. Norwood had told *The New York Times* (February 24, 1932): "How this Christ-like figure came to be there, of course, I don't know. It is an illusion that grows before the vision. Has thought the power of life? People can scoff but the figure is there."

Holy Tortilla

A classic of the simulacra genre was reported in 1978 at Lake Arthur, New Mexico. While Mrs. Maria Rubio was making burritos, she noticed the pattern of skillet burns on the tortilla. "It is Jesus Christ!" exclaimed the pious woman, and other family members agreed. After a priest reluctantly blessed the tortilla, she built a shrine for it, and thousands flocked from across the United States to witness the purported miracle and pray for divine assistance in curing ailments (Nickell 1998, 37).

In 1993, I appeared with Mrs. Rubio's daughter (among others) on an *Oprah* program about miracles. The audience did not seem to take the young woman seriously and later she sat in the show's green room looking, I thought, somewhat dejected. She brightened when I showed interest in her photos and invited me to visit her mother's shrine.

A decade later, with colleague Vaughn Rees I did. The supposedly sacred object is displayed in a small outbuilding in Mrs. Rubio's back yard. Alas, it is at best a former miracle, the image no longer being recognizable.

The Clearwater Virgin

Among the simulacra to get widespread and repeated media attention was one that appeared in late 1996 on the glass façade of a finance building in Clearwater, Florida. Composed of flowing lines that suggested the veiled head and shoulders of a faceless woman, the image was believed by the faithful to depict the Virgin Mary. It was curiously iridescent, its "rainbow colors" adding to the effect (Cox 2001).

Although never sanctioned by the local diocese, the image drew an estimated one million visitors over the next several years. The building was purchased by Shepherds of Christ Ministries—an Ohio-based Catholic revivalism group—and dubbed the Virgin Mary Building (Cox 2001). On March 1, 2004, the three uppermost panes of the window were discovered to have been broken by a vandal.[1] Shortly thereafter (on March 20), while in the area to give a talk, I was able to visit the site with Dr. Gary Posner. He had

investigated and tracked the Clearwater "miracle" claims and written a definitive article about them (Posner 1997).

A local chemist, Charles Roberts, had examined the window and drew on his forty years of experience in analyzing glass. He explained that the iridescent stain had been produced by water deposits combined with weathering, yielding a chemical reaction like that often seen on old bottles. "The culprit seems to be the sprinkler," Roberts concluded (Norton 1996; Posner 1997).

Indeed, as I walked around the glass-faced building with Dr. Posner and another local skeptic, astronomy professor Jack H. Robinson, we could see that there were other iridescent flow patterns on windows, each at a sprinkler location. One, on the west wall, had been dubbed the "Buddha" (Posner 1997).

The Milton Madonna

In June 2003, thousands of pilgrims and sightseers were drawn to a hospital at Milton, Massachusetts, where an image appeared on a second-floor window. Most people envisioned it as Mary cradling the infant Jesus, but some thought she was standing among clouds while others saw her astride a globe or atop a mountain (Virgin vision 2003).

I briefly commented on the phenomenon on CNN (July 13). Before appearing on Boston television, and later on BBC radio (together with a church spokesman), I traveled to Milton to conduct an on-site investigation. I interviewed a hospital information officer (Schepici 2003), took photographs (figure 2), and talked with various pilgrims. I had seen no need to disguise my identity and indeed was soon recognized by one of the Catholic evangelicals with whom I discussed the phenomenon.

Various claims and rumors about the "Milton Madonna" were untrue. The discoloration did not suddenly appear; rather, it began five years earlier when the seal of the double-paned window broke, allowing moisture from the brickwork to mix with a moisture-absorbing sealant. (The window is behind a permanent partition and so could not be reached from the inside.) Nor was this the only such discolored window on the premises; one on the end of the building, bearing a cloudy shape some saw as a "fetus," had earlier been replaced. A rumor that the replacement window cracked (as if in divine protest) was untrue. So was the notion—spread by anti-abortion zealots—that the "Madonna" image appeared in order to warn the hospital not to perform abortions; the facility actually lacks even an obstetrics unit (Heuer 2003; Schepici 2003).

Figure 2. A "Madonna" appearing on the window of a hospital at Milton, Massachusetts, in June 2003 drew some 25,000 faithful in a single weekend. (Photos by Joe Nickell)

Nevertheless, after an estimated 25,000 persons visited the site the first weekend, hospital officials issued a statement noting, ". . . a substantial safety issue has arisen that jeopardizes the ability of the Hospital to do its charitable work, to treat the sick and infirm" (Milton 2003). When devotees refused to heed the hospital's request to limit viewing between 5:30 to 8:30 P.M., officials responded by covering the window with a tarp and only removing it during that period (Redd 2003). Subsequently, a "cross" was discovered on the hospital's chimney, and other images were divined in nearby tree foliage.

Soon, however, attendance began to diminish, and a spokesman for the Boston Archdiocese, the Rev. Christopher Coyne, concluded that the phenomenon was neither a mystery nor a miracle (Heuer 2003). Indeed, that is true for all simulacra.

Note

1. A troubled teenager confessed to breaking the windows with slingshot-propelled ball bearings. He said he was expressing personal frustration, not acting out of any religious concerns; thus he was not charged with a hate crime (Tisch 2004).

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And the Mechanism Is . . .

Why do people fall in love? This ageless question has seen attempts at resolution by minds of the caliber of Aristotle and Shakespeare, and it is one of the last retreats of people who think that surely science cannot explain everything. And yet a recent book by anthropologist Helen Fisher (*Why We Love: The Nature and Chemistry of Romantic Love*, H. Holt, 2004) compiles an impressive amount of evidence that science can, indeed, infringe onto this most cherished realm of human romanticism. The book isn't actually particularly well written, and the arguments presented are circumstantial at best (there is also an annoying tendency to quote extensively from poets and writers, perhaps to sweeten the rationalistic blow that is the main message of the tome). Nonetheless, some of the findings are compelling, and provide me with an entry point to discuss what we mean when we say that *the* cause of X is Y.

But let's proceed with order, discussing some of the findings reported in Fisher's book. Monogamy isn't very common in the animal world, but male birds of species that exhibit this behavior, and that stick with the progeny to do their part in parenting, tend to have low levels of the hormone testosterone. This is an interesting correlation that suggests an obvious causal link between hormone levels and behavior. When scientists tested such hypothesis by injecting testosterone in these male birds, their behavior changed dramatically: they abandoned their offspring and went off to court other females. So what, you may say, *we* (*Homo sapiens*) are a heck of a lot more complicated, both physiologically and behaviorally, than birds, and one cannot willy-nilly translate such findings to the cultural complexities of twenty-first century humanity. Except that one can: It turns out that among humans, males with high levels of testosterone are less likely to marry, more likely to engage in extramarital affairs, and divorce more often (they are also more violent, being more likely to assault their spouse). Makes you pause, doesn't it?

Gerald Fried

But the broader philosophical point here is that—even considering the obligatory experimental and statistical caveats—can we say that philandering behavior is (at least in part) *caused* by high levels of a particular hormone? Well, yes, we can, but we should hasten to say that that is by no means the end of the story. There are additional, and equally interesting, levels at which one can analyze the causes of behaviors (or of anything else for that matter). For example, one might ask: okay, we may have evidence pointing to a causal link between testosterone levels and the propensity for

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philandering, but what causes such link? That is, how did it come about that testosterone, and not another hormone, plays that role? Or, for that matter, how is it that male birds and humans display such a component within their behavioral repertoire to begin with?

Here the quest for an answer ought to be undertaken in a different fashion, more appropriate to the kind of question we are asking. For instance, one may hypothesize (and this is much more difficult to back up empirically) that male philandering evolved by natural selection, to favor the spread of as many copies of the male's genes as possible by mating (and impregnating) as many females as possible. From this (hypothetical) perspective, then, the testosterone-behavior link is itself caused by the process of natural selection in natural populations, and is *one* but not *the* cause of male philandering.

My students and I came up with an analogy that might help drive the main point home. Suppose you are the detective in charge of investigating a homicide. You may ask yourself the generic question: Why did person X die? Immediately you realize that the appropriate answer varies with the level at which you wish the question answered. Do you mean what weapon caused X's death? Then the answer may be a gun. But why did a gun cause the death? Because the bullet shot by the gun penetrated the heart. But why does a bullet that enters a heart cause death? And so on, getting deeper and deeper into the mechanistic causes of X's death. You would also be getting further and further away from your police work, however, because the answers become increasingly irrelevant to your chief objective, which is to apprehend the killer.

You could then move your "why" search some levels up from the murder weapon: Why did somebody want to murder X? Because the latter was carrying some valuables that the killer wanted. But why did the killer have to actually commit murder to obtain whatever it is that he wanted? Because we live in a society that puts a premium on the possession of certain objects or wealth and that makes it easy for criminals to obtain possession of guns. And so on, again you could expand your search for causes and make it increasingly broader, though once more you would soon reach the point at which whatever answer you find isn't much relevant to the task at hand, solving the murder case.

The problem presented by multilayered levels of causality makes science such a fascinating enterprise, and yet one that tends to yield largely provisional results. What my example of the murder case and Fisher's question about philandering show is not only that the question of what causes a given phenomenon can meaningfully be asked at different levels of analysis, but that—depending on the circumstances—only some of these levels may be appropriate, or interesting. It is fascinating to a physiologist that just by manipulating the level of testosterone one can so dramatically change the behavior of a complex animal, regardless of why natural selection put such mechanism in place. To an evolutionary biologist, on the other hand, the precise mechanism (which hormone, acting how) is much less interesting than the question of why natural selection favored this sort of behavior to begin with. Different causes for different folks. □

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Tunguska 1, Roswell 0

This past summer, the Tunguska Space Phenomenon Foundation, led by Yuri Labvin, headed off into the wilds of the vast Krasnoyarsk territory to prove its theory that the huge 1908 explosion in Tunguska was not of natural origin. "We intend to find proof that not a meteorite but an extraterrestrial spaceship clashed with the Earth," Labvin told journalists on July 23 (see www.newsfromrussia.com/science/2004/07/23/55206.html). Almost miraculously, the very next week, he and his colleagues claim to have found exactly that—two strange, black stones in the form of regular cubes. (Others have suggested a more terrestrial origin for his alleged artifacts; see James Oberg's News and Comment on p. 5.) But Labvin doesn't deny that a natural celestial object was at least partly responsible for the enormous Tunguska explosion: his theory is that a natural celestial object, heading toward Earth, was approximately ten kilometers in the atmosphere when it collided with a UFO (see www.news.yahoo.com/news?tmpl=story&u=/afp/20040822/sc_afp/russia_space_meteorite_comet_040822230301).

Unfortunately, on this side of the ocean, the search for alien debris has been decidedly less successful. In a highly surprising development, the latest report on the dig at the alleged Roswell UFO-crash site shows that it turned up precisely nothing. According to *Wireless Flash Weird News,* "In an ending similar to that of Geraldo Rivera's special on Al Capone's vault, a team of investigators who dug up a field near Roswell, New Mexico, found no evidence to prove the 1947 UFO crash . . . the important thing was to prove that a UFO had made a gouge in the area they were excavating, and, unfortunately, they didn't turn up any material which suggested that was the case" (see www.ncbuy.com/news/2004-07-14/1010091.html). The chief investigator, Donald R. Schmidt, expressed concern that not only may wind and rain have scattered the expected extraterrestrial artifacts but "animals" may have been "stealing" them. Nonetheless, he plans to go back and look some more.

But don't assume that there hasn't been any recent news out of Roswell; the *Roswell Daily Record* reported on July 20 that "Fred, a fifty-pound mannequin designed to look like a gray space alien, was stolen around 4:30 P.M. from the corner of Main Street and Eighth Street near Alien Encounter's front entrance. Fred was reclining in a wheelchair on the sidewalk—where he sat every day for months as part of the local tourist attraction—when, according to owner David Baumann, two men parked a white and brown pickup truck by the curb, rolled him and his wheelchair into the vehicle and sped away" (see www.roswellrecord.com/archives/07200 4/news08.html). As for the wheelchair, Baumann used to explain to visitors that Fred was injured in the 1947 crash and needed special care. Veteran UFOlogist James Moseley remarked, "This theft may be the first case of humans abducting an alien, instead of vice versa!"

* * *

In an even more remarkable development, the *New Nation,* an independent news agency in Bangladesh, reports the discovery of a "giant human skeleton" in Saudi Arabia. This is not merely some overly tall fellow; a photo reveals that the former owner of this alleged skeleton was so huge that his skull alone dwarfs those attempting to dig it out (see www.nation.ittefaq.com/artman/exec/view.cgi/10/8519). The news article recounts the story from the Qur'an of the people of Aad and Hood. They were huge giants, capable of ripping out trees with a single hand. However, they disobeyed Allah, who smote them. Researcher Ulima Kiram of Saudi Arabia speculates that this Middle Eastern Paul Bunyan was a member of the tribe of Aad. Unfortunately, the discovery hasn't yet been reported to science because the Saudi Arabian military has sealed off the area (like the U.S. military does after a saucer crash), and they're keeping a tight lid on the whole thing. It's difficult to fathom a motive for that, however, since the skeleton, if authentic, would provide a powerful proof of the truth of their religion. And in another significant development from the region, a

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video being shown on Palestinian Authority TV claims that the Palestinian people have lived in the Holy Land since the Creation (see www.cnsnews.com/ViewForeignBureaus.asp?Page=\ForeignBureaus\archive\200407\FOR20040730d.html).

* * *

We recently mentioned the controversy over a man calling himself Dan Burisch, who claims to be a microbiologist who has worked on cloning alien viruses for a rogue black-op government program at Area 51, alongside an alien named J-Rod (*Psychic Vibrations*, July/August 2004). Research by George Knapp and others published in August in *UFO Magazine* (vol. 19, no. 4) has pretty well sent his credibility crashing down faster than a UFO daring to fly over New Mexico (see www.virtuallystrange.net/ufo/updates/2004/aug/m11011.shtml). Burisch, whose real name is Dan Crain, claims to have earned a Ph.D. at the State University of New York in 1989, but the school has no record of that. During the time he claims to have been earning his Ph.D., he was in fact working as a parole officer in Las Vegas. But UFO journalist and researcher Linda Moulton Howe, one of the biggest supporters of Burisch's claims, says that she still believes his wild story about working with aliens because of his "sincerity."

Meanwhile, Michael Salla, whose scholarly research on "exopolitics" and "alien stargates"—he was also highlighted in that same July column—reports that "the program I had been developing, the Peace Ambassador Program [at American University in Washington, D.C.], was summarily terminated in late April 2004" (see www.exopolitics.org/PA-termination-factsheet.htm); his teaching contract was suspended soon afterward. His first hint of difficulty with the University came in February, when he was interviewed by the *Washington Post* and told them about President Eisenhower's alleged meeting with aliens in 1954, a meeting that the Eisenhower Library most emphatically denies. Salla characterizes this as "an example of censorship and intimidation of academic researchers exploring extraterrestrial related topics," while others are applauding the university's newfound recovery of common sense.

* * *

What else is new in the world of the bizarre? The Chilean newspaper *Diario el Centro* reported on July 7 an incident in Parral that left fourteen sheep dead and one man injured. The victim, a man named Juan Acuna Periera, told doctors that the creatures attacking him appeared to be "winged dogs," a species of paranormal menace not previously reported. Some locals suggest that the attacking beasts are only blood-sucking chupacabras, not flying canines, but urge their neighbors not to go outside at night in any case (see www.virtuallystrange.net/ufo/updates/2004/jul/m11-029.shtml). Nor are winged dogs and chupacabras the only creatures plaguing the citizens of Chile: reports from Pampa Acha tell of "dog-faced kangaroos" that float through the air and traumatized a family of six one evening (see www.paranormalnews.com/article.asp?ArticleID=1036).

And here's a new slant on the old "alien in a pickle jar" story: reports are beginning to build up of cases where authorities have been called in and implemented security measures when a discarded toy alien body has been mistaken for a human fetus (see www.virtuallystrange.net/ufo/updates/2004/aug/m13-013.shtml). The small alien "bodies" are made out of rubber or plastic and sold as novelty items. They usually are encased in a slimy-looking liquid. They come in containers with fanciful labels like "Property of Area 51" or the like. I was given one of these things as a gift, and it's creepy. I used to take it with me when I traveled to give UFO talks, but now with increased airline security, I don't think it's wise to carry something on board labeled "Bio-Hazard Level One," even if it is only in jest. □

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The Secrets of Rennes-le-Château

What if the Holy Grail, the San Greal, was not the legendary and elusive cup that held the blood of Christ dying on the cross but was itself a blood, or a bloodline, a "*sang real*," a "royal blood?" The idea, suggested for the first time in *Holy Blood and Holy Grail*, a 1982 book by British journalists Henry Lincoln, Richard Leigh, and Michael Baigent, is at the core of Dan Brown's bestseller *The Da Vinci Code*.

Lincoln and his colleagues suggested that the "royal blood" is that of Jesus Christ, who did not die on the cross but survived the ordeal, married Mary Magdalene, had a child, Sarah, and the bloodline secretly survived and continued for 400 years, up to the Merovingian dynasty of the Franks of dark-age Europe. Jesus died an old man in France, where he fled with his family to escape prosecution from Peter and the Apostoles, and was buried near a little town on the Pyrenees, Rennes-le-Château.

This amazing story was supposedly kept secret for two millennia by the Priory of Sion, a mysterious sect that is said to have also founded the Order of the Templars. Notwithstanding the secrecy, clues to this concealed story were scattered throughout the centuries by some initiates belonging to the Priory, such as Leonardo da Vinci,[1] Isaac Newton, Victor Hugo, and Claude Debussy. This is how Lincoln and friends have been able to reassemble the

story, uncoding hidden names, enigmas, wordplays, and hints hidden in various paintings.

But is this all true?

In order to better understand the story, I visited the remote town of Rennes-le-Château (RLC) on the Pyrenees last July.

The Legendary Treasure

The story of the RLC myth starts in 1969, when Henry Lincoln read a thriller by French author Gérard de Sède, titled *Le trésor maudit* (*The Cursed Treasure*). In the fictional story, the treasure of the title had been found around 1891 by the priest of RLC after he deciphered some old documents hidden in the local church.

The priest was Bérenger Saunière, who had been the priest of RLC since 1885. RLC sits on top of a hill, about 40 kilometers from Carcassonne, in France.

The church, dedicated to Mary Magdalene, was almost in ruins when Saunière arrived in RLC. Having raised some money, the priest started restoration around 1887. From here on, facts are few and fantasy creeps in. According to legend, by moving a heavy stone that served as the altar, Saunière found that one stone pillar supporting the slab was hollow and contained four parchments. Two of them detailed a genealogy, while the other two presented enigmatic writings that, once deciphered by experts in Paris, allowed Saunière to obtain some very strange messages.

One of the most important ones was the following: *A Dagobert II Roi et a Sion est ce tresor et il est la mort* ("To King Dagobert II and to Sion belongs this treasure, and he is dead there").

While in Paris, the priest bought reproductions of a few paintings, including Nicholas Poussin's *The Shepards of Arcadia*. The painting, dated 1640, shows some people standing close to a sarcophagus holding the inscription: *Et in Arcadia Ego* ("And in Arcadia, I"). It was said that the sarcophagus really existed near Rennes-le-Château

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and was identified by matching the mountain profile on the painting with the real one.

Meanwhile, work at the church continued, and another stone slab was found under the floor, but only Saunière had access to it and could see what was behind it. From that moment on, the priest began long and secretive searches of the surrounding area, and after that, the restorations started once again. This time, however, funds seemed limitless, and Saunière used them to buy land and to build a number of constructions around his parish church, including a bizarre "Tower of Magdala" honoring Mary Magdalene. He also filled the church with mysterious statues and had various Latin inscriptions written all around the place, including one at the entrance of the church which reads: *Terribilis est locus iste* ("This place is terrifying").

Where did Saunière's riches came from? According to Lincoln and colleagues, Saunière found a treasure that included much more than valuable antiquities. Buried in Rennes-le-Château were documents confirming that Jesus Christ had come to live in France with his family and that his child initiated a dynasty which eventually became known as the Merovingian Kings of France.

One of the secret messages stated that the "treasure," (meaning the secret of the bloodline) belonged to King Dagobert II, a Merovingian, and to the Priory of Sion. "And he is dead there," then, may indicate the presence of a sepulchre containing the body of Christ. Such a tomb, it was reasoned, was the one painted by Poussin, since the phrase *Et in Arcadia ego* could be anagrammatized: *I! Tego arcana dei*, meaning: "Go away! I hold the secrets of God."

With such notions in hand, Saunière could have turned Christianity on its head and inspired a whole new interpretation of world history. So why not use it to blackmail the Vatican and obtain wealth by these means?

Decoding the Enigma

But this, as I said, is the legendary version of the story. The facts are quite different, and I had the opportunity to verify this during my trip to RLC. The hollow pillar that contained the parchments, for example, is still preserved in the museum of the village, and you can see that it is not hollow at all but has only a very small hole (the size of a CD box), where no parchments could be hidden. Saunière's trip to Paris may be another invention, since no proof of it exists.

Buried in Rennes-le-Château [so the legend goes] were documents confirming that Jesus Christ had come to live in France with his family and that his child initiated a dynasty.

The pillar at Rennes-le-Château.

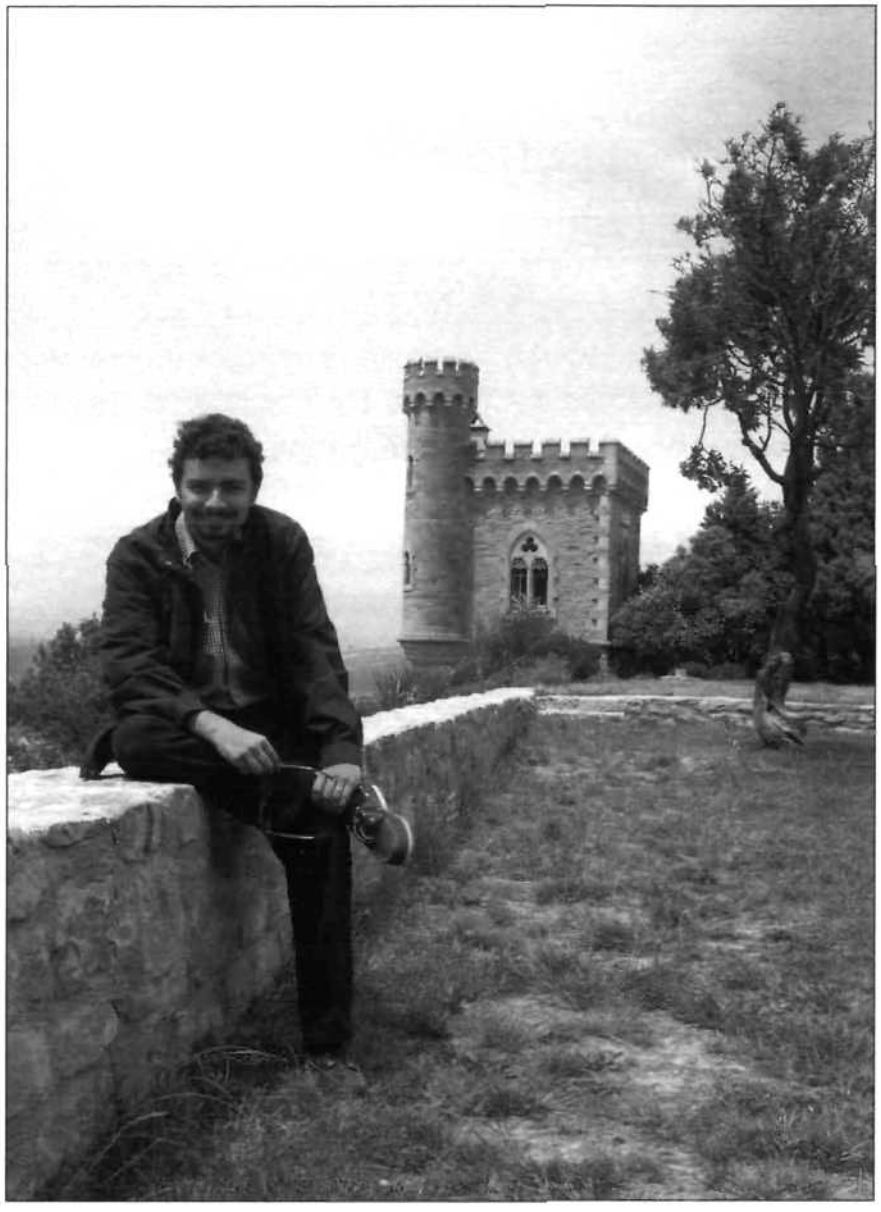
As to the sepulchre painted by Poussin, thanks to my colleague Mariano Tomatis I was able to locate the exact spot where it was said to exist. However, such a tomb did not exist when Poussin created his painting in 1640, because the tomb was built in 1933. It is true that it resembled the one in the painting, but it also resembled the dozens of similar tombs scattered around the area. After continuous invasions by treasure hunters, the tomb was destroyed in 1988. Furthermore, the profile of the mountains in the painting bears only a slight resemblance to similar mountains around the area.

Other enigmas have simpler solutions. The inscription that reads, "This place is terrifying" actually is a biblical quotation (Genesis 28:17) meaning "This place is wonderful." (The complete phrase is: "How dreadful is this place! This is none other but the House of God, and this is the gate of Heaven."

Another inscription that appears at the base of a crucifix, "*Christus A.O.M.P.S. Defendit*," had been translated by some as *Christus Antiquus Ordo Mysticusque Prioratus Sionis Defendit* ("Christ defends the ancient mystical order of the Priory of Sion"). In reality, that is a common phrase used in some Catholic inscriptions, like the one in Rome on Pope Sisto V's obelisk: *Christus Ab Omni Malo Plebem Suam Defendat* ("Christ defends his people against every evil").

While no documents and no secrets were discovered, however, it is true that the priest found some valuable artifacts during restorations of the church. He noted such a discovery in his notebooks and tried to keep it secret in order to sell the objects and raise money. He also started to excavate the church's surroundings, hoping to find more.

Is this, then, the true and only source of Saunière's wealth? Actually, there was something else. Rumors had spread around of Saunièr's spending attitudes, and the local Catholic bishop investigated the matter, concluding that the priest had made his money from "trafficking in Masses," a quite common wrongdoing among nineteenth and early-twentieth-century priests. In the Catholic Church, Masses can be celebrated for the benefit of a specific soul,



in the hope of helping a deceased loved one to ascend from Purgatory into Heaven. Masses can also be said for a specific aim for the benefit of living persons (for instance, for healing purposes). Prior to Vatican II, priests received a stipend for each Mass they said. "Trafficking in Masses" meant, in practice, that priests advertised their willingness to celebrate a great number of Masses for both the dead and the living. Advertising in this way was regarded as a kind of unfair competition with other priests and was condemned by the Church. The matter became even worse, of course, when priests failed to celebrate the Masses requested, despite having received the appropriate payment.

The bishop traced advertisements placed by Saunière in Catholic magazines throughout France, and even abroad, and quickly determined that he could not possibly have celebrated all the Masses he had received payments for, thus in fact defrauding his "clients."

In 1909, the Bishop asked Saunière to leave RLC; the priest refused and was suspended from his priestly duties and privileges, thus ending his ecclesiastical career. He died in 1917 and left all his belongings to his housekeeper, Marie Denarnaud.

The Would-be King

Now another question remains to be answered: Who invented such an incredible story? As usually happens in every thriller, the culprit is almost always the one who stands to gain from the crime. Though there is no crime here, there could have been, and the perpetrator would have been one Pierre Plantard.

Plantard was an anti-Semite and the leader of a minor occult, right-wing organization known as Alpha Galates. His scheme was quite ingenious and complex. He had the parchments made by an artist friend, Philippe de Cherisey; then, he passed them on as real to Gérard de Sède, to whom he also told the invented story of Saunière's findings.

Plantard also invented the Priory of Sion in 1956 and created fake manuscripts and documents that linked the Priory to RLC and deposited them at the National Library in Paris, where he suggested Lincoln and friends go to look for important discoveries.

But why go to all this trouble? All this and more was necessary in order to demonstrate not only that Plantard was the current Grand Master of the elusive Priory but also that he was the last descendant of the Merovingians. This meant that he was the current vessel of Christ's holy blood and, above all, the heir to the throne of France as its legitimate king.

The scheme did not work out, however; there were no descendants after Dagobert II, and there were no living Merovingians pretenders to the throne that fell with Louis XVI. Plantard's fake geneology quickly dissolved under close scrutiny.

As Umberto Eco wrote in his novel *Foucault's Pendulum*, "Believe that there is a secret and you will feel an initiate. It doesn't cost a thing. Create an enormous hope that can never be eradicated because there is no root. Ancestors that never were will never tell you that you betrayed them. Create a truth with fuzzy edges: when someone tries to define it, you repudiate him. Why go on writing novels? Rewrite history." And this is exactly what Pierre Plantard and his followers tried to do.

Note

1. His name was Leonardo; "da Vinci" is not his surname but a reference to the place were he was born, meaning "from Vinci." So does the title of Dan Brown's book mean that the code relates to the little town of Vinci? □

A Call for Attention to Climate Change

As president emeritus of Stanford University, former commissioner of the Food and Drug Administration, and current editor in chief of *Science* magazine, Donald Kennedy is a hard scientist to ignore. And now he's shouting from the battlements a resounding message: "Get ready for global warming." On June 15, Kennedy hosted a star-studded conference on climate change hosted by the American Association for the Advancement of Science (AAAS) in Washington, D.C., an all-day event clearly designed to put the issue squarely on the public agenda. The assembled speakers powerfully argued that, despite a continuing gap between alarmed scientists and a yawning public, we would be foolish to ignore global warming—despite the siren calls of so-called "skeptics" who continue to dispute mainstream conclusions on this issue.

At the AAAS session, Kennedy pointed to a "growing dissatisfaction" among scientists that the consensus they've reached on human-caused, or anthropogenic, global warming has been so poorly communicated to the public at large. While admitting that questions remain about the way climate change will affect our future, Kennedy nevertheless argued that none of these uncertainties constitute "an argument for waiting," given the severity of the possible consequences. "It really is time to get some serious policy traction on this issue," he declared.

Kennedy's call to action drew strength from the impressive cast of speakers who preceded him. Drawing on a wide range of evidence, these scientists convincingly demonstrated that human-induced climate change has already begun. First, F. Sherwood Rowland, who won the Nobel Prize in chemistry for his work on the role of CFCs in causing ozone depletion, explained that the greenhouse effect—in which atmospheric gases like carbon dioxide trap Earth's heat and prevent it from escaping—is "a very well-established scientific principle." And it provides firm grounds for concern: Atmospheric carbon dioxide levels have been steadily rising thanks to fossil-fuel emissions and now stand at 380 parts per million (ppm). Meanwhile, we've witnessed a one-degree-Fahrenheit rise in global temperatures between the early 1800s and the present, with most of the change occurring in the past decade.

Putting that 380 ppm figure in context, a later speaker, Harvard geochemist Dan Schrag, pointed out that carbon dioxide levels have not exceeded 300 ppm for the last 400,000 years. And by 2040 or 2060, he added, it's projected that we'll reach 500 ppm! Comparing where we're headed to the sultry Eocene epoch many millions of years ago—when palm trees grew in Wyoming and crocodiles lived in the Arctic—Schrag concluded, "We're performing an experiment at a planetary scale that hasn't been done for millions of years."

Drawing further upon paleoclimatology, other scientists argued that recent warming has been occurring faster "than anything we've seen in Earth history," as Duke's Thomas Crowley put it. To bolster this contention, Crowley showed how a range of different proxy data—derived from tree rings, ice cores, and coral reefs—all independently confirm the anomalous nature of recent warming when viewed in the context of the past thousand years.

Later presenters went on to highlight the evidence of climate change that surrounds us today. Sea levels are rising, noted Princeton's Michael Oppenheimer, and polar ice sheets appear vulnerable to significant future melting. Mountain glaciers worldwide are retreating, added Ohio State's Lonnie Thompson. "Within thirty years there will be no ice in Glacier National Park," he predicted. Meanwhile, a wide range of species are adjusting their habitat ranges in response to temperature shifts, noted Chris Field of the Carnegie Institution, sometimes at rates of up to several miles per decade.

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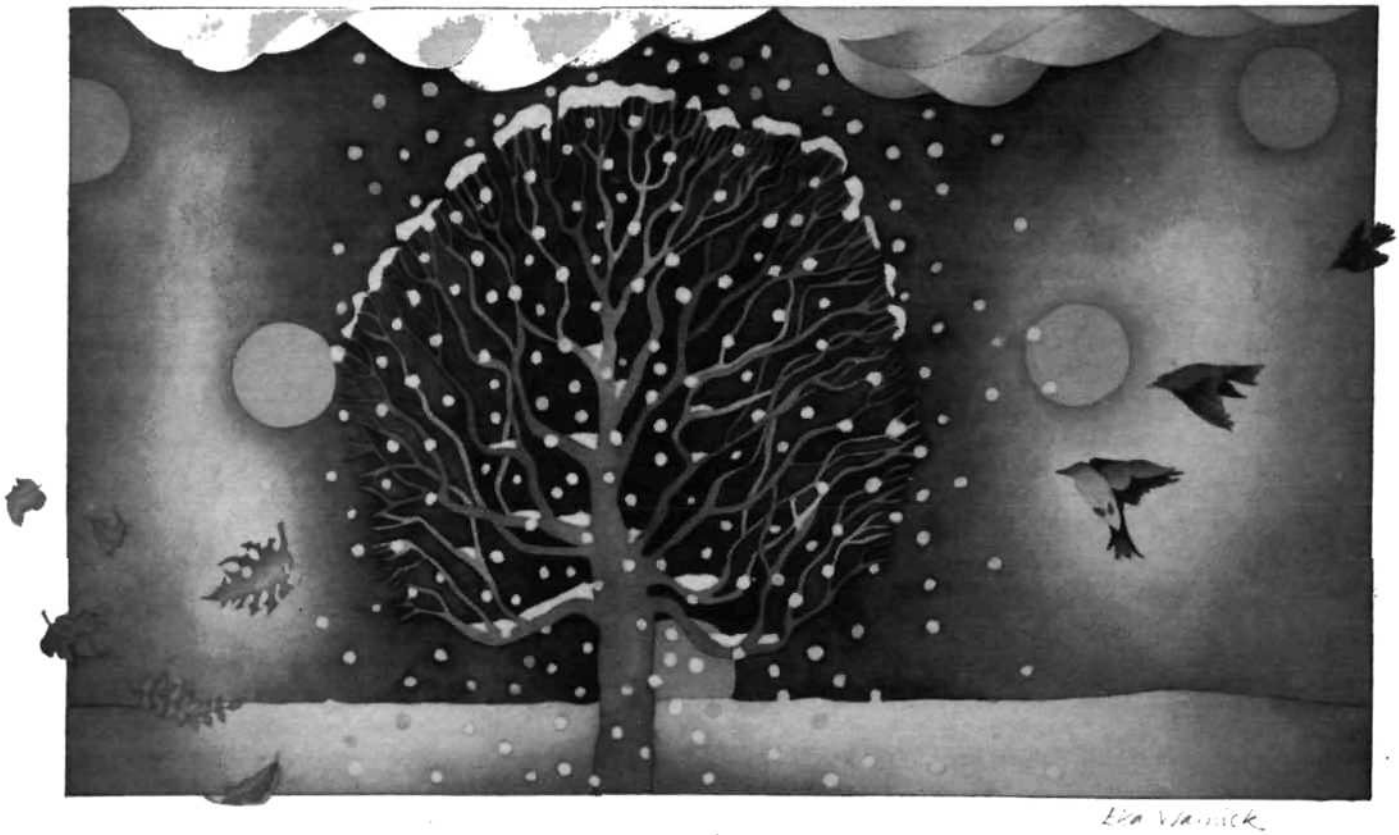

Perhaps most troubling, the scientists concurred that current climate models may underestimate both the magnitude and the rapidity of coming changes. "The real world never changes smoothly, it always bumps and jumps and wiggles," said geoscientist Richard Alley of Penn State University. In other words, in the future, we should expect the unexpected from the climate. Therefore, uncertainty about what may happen hardly constitutes a cause for inaction; on the contrary, it should be deeply worrisome.

None of the so-called climate change "skeptics"—Fred Singer of the Science and Environmental Policy Project, the Cato Institute's Patrick Michaels, and others—presented their views at this event. It's a safe bet that they would have disagreed with much of what was said, probably quibbling over every last detail. Certainly they would argue that the AAAS and Kennedy are presenting a highly skewed perspective on a complex and contentious issue. In fact, they've argued precisely that in the past. But few of these "skeptics" have been publishing very much lately in the peer-reviewed scientific literature. Despite efforts to derail it, a global consensus on climate change has formed and has been embraced by both the U.S. National Academy of Sciences and the United Nations's Intergovernmental Panel on Climate Change (IPCC). "Consensus as strong as the one that has developed around this topic is rare in science," Kennedy has noted.

Why does this matter? Well, the scientists whose views I detailed above fit firmly into the mainstream and were presenting consensus positions, not controversial ones. It would be a stretch to say that the theory of anthropogenic climate change has become as firmly established as, say, the theory of evolution, but there are telling similarities. Both views have won broad acceptance by the vast majority of scientific experts and now only come under fire from a small band of contrarian outliers. Moreover, the outliers aren't contributing much real science at this point. With a few exceptions, they're taking their case straight to journalists and public policymakers, an end run around the peer-review process. And of course, when the debate isn't going their way, they cry persecution.

Skeptics should recognize many of these traits; we've seen them before, not just in antievolutionists but among a wide variety of fringe scientists. At the very least, then, it seems that anyone who claims to be a science defender—but questions the reality of human-induced climate change—should have to answer the following question: Why trust the mainstream scientific community on other issues but not this one? One possible response—dismissing today's climate science as warped by environmentalist alarmism—strikes me as simply untenable. If we truly believe that ideology can so corrupt the scientific method in one field, then why place any more trust in the rest of science?

Though Kennedy and his colleagues have won major media coverage for their cause, it's tough to say whether their efforts will truly affect our politics. Certainly little can be expected in an election year. Still, when leading scientists descend upon Washington and loudly ring the alarm bells, it would be the height of folly not to treat their warnings with the utmost seriousness. Like the vice president in the disaster film *The Day After Tomorrow*, any politician who does otherwise may have a painful apology to make later. □

Bacteria, Ulcers, and Ostracism?

H. Pylori *and the Making of a Myth*

Medicine's purported ostracism of the discovery of H. pylori *has achieved a mythological quality. But it isn't true. After appropriate initial scientific skepticism, the hypothesis was accepted right on schedule.*

KIMBALL C. ATWOOD IV

In the September/October 2003 SKEPTICAL INQUIRER, I wrote an article critical of the research agenda of the National Center for Complementary and Alternative Medicine (NCCAM) (Atwood 2003). Subsequently, reader Myra Jones argued in a letter to the editor that "we as skeptics should not throw the baby out with the bath water. Just because the NCCAM has funded bad science doesn't mean that . . . some alternative medicine might not have valid claims. Many practices now accepted were once thought crazy by the medical mainstream" (Jones 2004). Part of my reply to her was this: "For example, which practices? Initial skepticism of any new claim is an appropriate part of the scientific approach. . . . Other than that, I challenge Ms. Jones

to name a single example, since the era of scientific medicine began in the second half of the nineteenth century, of a correct claim that faced dogmatic, closed-minded rejection by the 'medical mainstream' for any significant amount of time" (Atwood 2004).

Be careful what you ask for. A few weeks later, the editors received this letter from Dr. Tess Gerritsen:

> As a physician, a long-time skeptic, and a member of CSICOP, I'm happy to agree with most of Dr. Atwood's points about alternative medicine. However, when he challenged letter writer Myra Jones to come up with a "a single example, since the era of scientific medicine began in the second half of the nineteenth century, of a correct claim that faced dogmatic, closed-minded rejection by the 'medical mainstream' for any significant amount of time," I must respond in Ms. Jones's defense.
>
> When I was first starting out in medical practice, back in the early 1980s, the accepted treatment for peptic ulcer disease was a bland diet plus antacids and more antacids. Later, histamine H2-receptor antagonists were added to the treatment. But that was it, case closed.
>
> Then, in 1984, physicians Warren and Marshall from Australia claimed that peptic ulcer disease was not caused merely by overproduction of gastric acid, but rather by a specific bacterium: *Helicobacter pylori*, to be specific. They recommended antibiotic therapy. Believe me, they were ridiculed by the medical establishment. I recall my colleagues, and even my own physician-husband, scoffing at the idea of peptic ulcers being an infectious disease. For the next thirteen years, most of the "medical mainstream" refused to let go of their calcified notion that the only treatment for ulcers was to combat gastric acid secretion. After all, that was what we all learned in medical school. Therefore, it had to be the truth!
>
> It wasn't until 1997 that the CDC finally put out the word to the nation's doctors: Drs. Warren and Marshall had been correct all along. *Helicobacter pylori* was, indeed, the cause of most cases of peptic ulcer disease. The treatment, at long last accepted by mainstream medicine, is now antibiotics.
>
> This is only one example; I'm sure my physician colleagues can think of others. This is a case where skepticism (my own and that of others) delayed the use of effective ulcer treatment for over a decade. I think Ms. Jones's warning that we "not throw out the baby with the bath water" is indeed a good one. Skepticism is good and healthy, but at its extreme, it can turn into rigid closed-mindedness.

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This is an oft-heard argument. Ms. Jones, in response to my challenge, offered the same example in a private e-mail to SI editor Kendrick Frazier. "CAM" supporters brought it up a couple of years ago at a meeting of the Massachusetts Special Commission on Complementary and Alternative Medical Practitioners, of which I was a member. At least one recent article in a mainstream medical journal has made the same claim, without attribution (Kaptchuk 2003). Medicine's purported ostracism of the discovery of *H. pylori*—to some extent, as we shall see, fostered by one of its discoverers—has achieved a mythical quality.

The warning that by refusing to commit scarce resources to the investigation of implausible claims, we risk "throwing the baby out with the bath water," implies that we have little basis for deciding which claims merit further investigation.

But it isn't true. I have no reason to doubt that many physicians scoffed when first faced with the notion of a bacterial basis for peptic ulcer disease (PUD). It is not the case, however, that the medical mainstream dogmatically rejected the proposal for an undue period of time. A brief history shows that the hypothesis was accepted right on schedule, but only after "appropriate initial skepticism"—the premise of my challenge—was satisfactorily answered. Some of the other particulars of the mythical version of the story are also incorrect.

Before proceeding, I would like to reiterate another point made in the context of the challenge: all biomedical proposals, "CAM" or otherwise, can only be judged according to what is known about nature. The warning that by refusing to commit scarce resources to the investigation of implausible claims, we risk "throwing the baby out with the bath water," implies that we have little basis for deciding which claims merit further investigation. But that isn't true, either.

Background

Medical researchers Robin Warren and Barry Marshall first reported the curious finding of "unidentified curved bacilli on gastric epithelium in active chronic gastritis" (not ulcer) in two letters to the British journal *Lancet*, published on June 4, 1983. They noted that similar bacteria had been described intermittently, possibly as early as the nineteenth century and certainly since 1938, but that these had never been cultured and their significance was unknown. They explained that the bacteria cannot be seen with usual staining methods and surmised that this is why they had typically been overlooked. They reported that the bacteria are found beneath gastric mucus, thus possibly explaining how they might be protected from gastric acid. They noted that similar bacteria had been described in other mammals and were thought to be "commensals"—harmless inhabitants of the gastric mucosa (stomach epithelium). Nevertheless, because Dr. Warren had found the bacteria in biopsy specimens of inflamed gastric mucosa but not in normal ones, Dr. Marshall cautiously suggested, "If these bacteria are truly associated with gastritis . . . they may have a part to play in other poorly understood, gastritis associated diseases (i.e., peptic ulcer and gastric cancer)" (Warren and Marshall 1983).

One year later, in the June 16, 1984, *Lancet*, Marshall and Warren published their first full paper on the topic. They further characterized the bacterium, reported its first successful culture, and established that it was a new species of unclear relation to any previously characterized. At that time, they and others were still referring to it as a form of campylobacter—variously called *C. pyloridis* or *C. pylori*—because of morphologic similarities with other campylobacter species, but Marshall and Warren recognized that there were important differences. These differences eventually led to it being renamed *Helicobacter pylori.*

The authors reaffirmed the association of the bacterium with gastritis, but they now also reported it in association with both gastric and duodenal ulcers. Nevertheless, they remained cautious: "Although cause and effect cannot be proved in a study of this kind, we believe that pyloric campylobacter is etiologically related to chronic antral gastritis and, probably, to peptic ulceration also" (Marshall and Warren 1984). They did not recommend antibiotic treatment but reported that bismuth—an established treatment for PUD when coupled with acid suppression, that seemed to be associated with reduced relapse rates compared to acid suppression alone—was bactericidal to the new "pyloric campylobacter." A bacterial cause of PUD, they suggested, could thus explain the finding of a reduced incidence of relapse in patients treated with bismuth. All of this was plausible but, of course, still new and unproved.

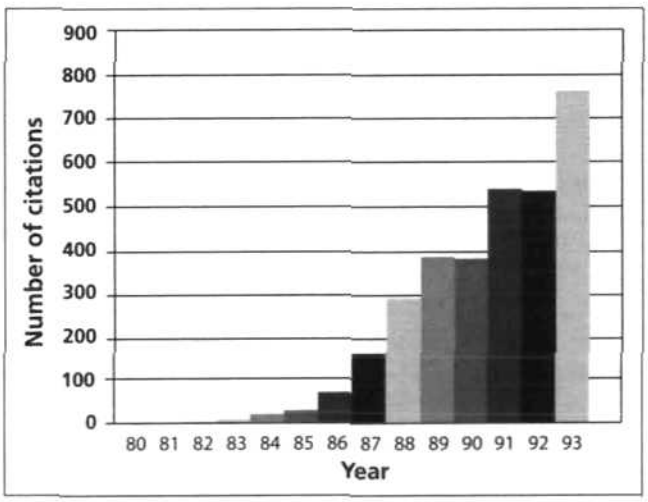
The Initial Response of Investigative Medicine

For Marshall and Warren's proposal to gain scientific and clinical momentum, several requirements had to be met: others had to confirm both the bacteriologic and clinical findings; stronger evidence than mere "bystander" status for an etiologic (causative) role of the bacteria in PUD had to be offered and replicated; diagnostic methods less cumbersome and expensive than endoscopy, biopsy, and culture—the methods used by Warren and Marshall—had to be developed; and antibacterial treatment had to be shown to be more useful—i.e., as safe as but more effective than—standard treatments. The last requirement was not trivial, as I will discuss. All these steps would take time.

One might expect that if scientific medicine had dogmatically rejected Warren and Marshall's hypothesis, there would be scant references to their reports for the several years after the initial publications. The opposite is the case: the biomedical world was abuzz with *Campylobacter pylori* from the start, as is demonstrated in the figure. It shows the number of papers listed on PubMed, the online database of the National Library of Medicine, as a function of the calendar year throughout the 1980s and early 1990s. The rate of increase after 1983 is nearly exponential. Anyone who doubts the infatuation that medicine had with *C. pylori* at the time can surf to PubMed and, using the same search criteria that I used to generate the data for the figure, peruse thousands of abstracts.

Within a couple of years of the original report, numerous groups searched for, and most found, the same organism. Bacteriologists were giddy over the discovery of a new species. By 1987—virtually overnight, on the timescale of medical science—reports from all over the world, including Africa, the Soviet Union, China, Peru, and elsewhere, had confirmed the finding of this bacterium in association with gastritis and, to a lesser extent, ulcers. Simpler and less invasive diagnostic methods were devised (Graham et al. 1987; Evans et al. 1989). The possibility of pyloric campylobacter being the cause of gastritis or ulcers was exciting and vigorously discussed, even as it was acknowledged by all, including Marshall and Warren, to require more evidence. Here is a typical opinion, in this instance from the Netherlands: "There is an explosion of interest in the role of *Campylobacter pylori* as a cause of active chronic gastritis. . . . To what extent this intriguing microorganism is causally related to peptic ulcer disease remains to be elucidated, but all the evidence which is available so far supports a pathogenetically important role" (Tytgat and Rauws 1987).

The New England Journal of Medicine, the most widely read medical journal in the world, offered this editorial: "Further unfolding of the details [of the possible etiologic role of



Search performed at PubMed (www.ncbi.nlm.nih.gov/PubMed) using the search terms *campylobacter pylori* or *campylobacter pyloridis* or *campylobacter pyloric* or *campylobacter*-like or *helicobacter pylori* or *curved bacilli gastric*. The 1982 and one of the 1983 citations had to do with animal studies.

Year	Number of citations
1980	0
1981	0
1982	1
1983	2
1984	16
1985	25
1986	58
1987	155
1988	283
1989	383
1990	379
1991	539
1992	538
1993	762

C. pylori in peptic ulcer disease] will be enhanced by the development of an animal model, by epidemiologic studies, and by identification of the source and the virulence properties of specific serotypes of *C. pylori*. The prospects are exciting, intriguing, and promising" (Hornick 1987).

The Quest for Proof of Cause

Establishing that a microbe is the cause of a specific disease is not a simple task. The mere presence of microorganisms, even if reliably found in association with diseased tissue, does not prove that the organism causes the disease. Myriad species of bacteria and fungi are always present in the human large intestine, for example, but most never cause diseases. Thus, there must be specific evidence of cause and effect.

The accepted standard for establishing such a causal relation was offered by Robert Koch in 1882, during the flowering of the Germ Theory of disease. As described in his classic lecture "Die Aetiologie der Tuberkulose," Koch established the bacterial cause of tuberculosis by the following steps:

1. He harvested, from post-mortem specimens of human lung and brain tissues taken from patients who had died of tuberculosis, a characteristic bacterium with identical microscopic features in every case.
2. He grew these bacteria by placing specimens of diseased tissue onto appropriate solid-culture media. Solid-culture media, one of Koch's most important innovations, allowed him to discern discrete colonies of bacteria, for the first time providing a method of isolating pure cultures. By serially reintroducing bacteria from these colonies onto new media, he achieved pure cultures of bacteria identical to those originally found but without any possibility of contamination from the original sample. The bacterial progeny manifested the same microscopic features as those he had originally found.
3. When he introduced these offspring into guinea pigs, the result was the characteristic disease of tuberculosis (the guinea-pig variety).
4. He then recovered the identical organism from the diseased guinea-pig tissues (Koch 1882).

These steps became known as "Koch's postulates" and resulted, over the next twenty years, in the elucidation of most bacterial and parasitic diseases that had afflicted humankind during historical memory. It would have been more certain for investigators to reintroduce the pure cultures into humans instead of nonhuman animals, because one could not know that all infectious diseases in humans have susceptible hosts in the animal world; and as subsequently has become clear, they don't. For obvious reasons, this has not usually been done.

Part of the problem for *C. pylori* was that for several years after Marshall and Warren had first cultured it, there was no good animal model. Thus efforts to satisfy Koch's postulates were hampered. Fortunately, much had changed since Koch's time, such that a presumption of a microbial cause of a disease could now be based on additional evidence: specific immune responses to the organism, an elucidation of microbial pathogenesis at the tissue and molecular levels, response to specific treatment, and more. An important difference between the *H. pylori* story and what Koch faced is that there were now effective treatments for bacterial diseases, unavailable in Koch's time. Thus a "proof in the pudding" was possible. That eventually became the clincher for *H. pylori*.

Unlike anthrax, TB, pneumococcal pneumonia, bubonic plague, malaria, cholera, and other dreaded microbial diseases investigated near the end of the nineteenth century, presumptive *H. pylori* gastritis or even peptic-ulcer disease is not particularly dangerous.

Another difference is that unlike anthrax, TB, pneumococcal pneumonia, bubonic plague, malaria, cholera, and other dreaded microbial diseases investigated by Koch and others near the end of the nineteenth century, presumptive *H. pylori* gastritis or even peptic-ulcer disease is not particularly dangerous. It was also eminently treatable in the 1980s even without antibiotics and prior to any knowledge of *H. pylori*—a point that belies any argument that a delay in accepting the bacterial hypothesis caused widespread, unnecessary suffering.

The relatively indolent nature of presumptive *H. pylori* disease led some investigators to attempt to demonstrate cause by the most direct of means. In the 1985 article "Attempt to fulfill Koch's postulates for pyloric Campylobacter," Marshall and colleagues reported that a normal volunteer had swallowed a pure culture of the organism. The result was " . . . a mild illness . . . which lasted fourteen days. Histologically proven gastritis was present on the tenth day after the ingestion of bacteria, but this had largely resolved by the fourteenth day. The syndrome of acute pyloric campylobacter gastritis is described" (Marshall et al. 1985).

This constituted highly suggestive evidence that the organism caused gastritis. But it was far from conclusive, because it involved a single subject and was reported by the very author most wedded to the hypothesis. Thus, replication by others would have been required. Perhaps more important was that the subject, who was none other than Marshall himself, failed to develop an ulcer. Note also that the disease resolved without treatment.

As unlikely as it may seem, such a human demonstration was twice repeated with similar results. As late as 1995,

Marshall himself reviewed these studies and conceded that Koch's postulates, still the "gold standard" for demonstrating a microbial cause of a disease, had not been fulfilled for *H. pylori* and peptic-ulcer disease (Marshall 1995).

Persuasive Evidence for Etiology and Treatment

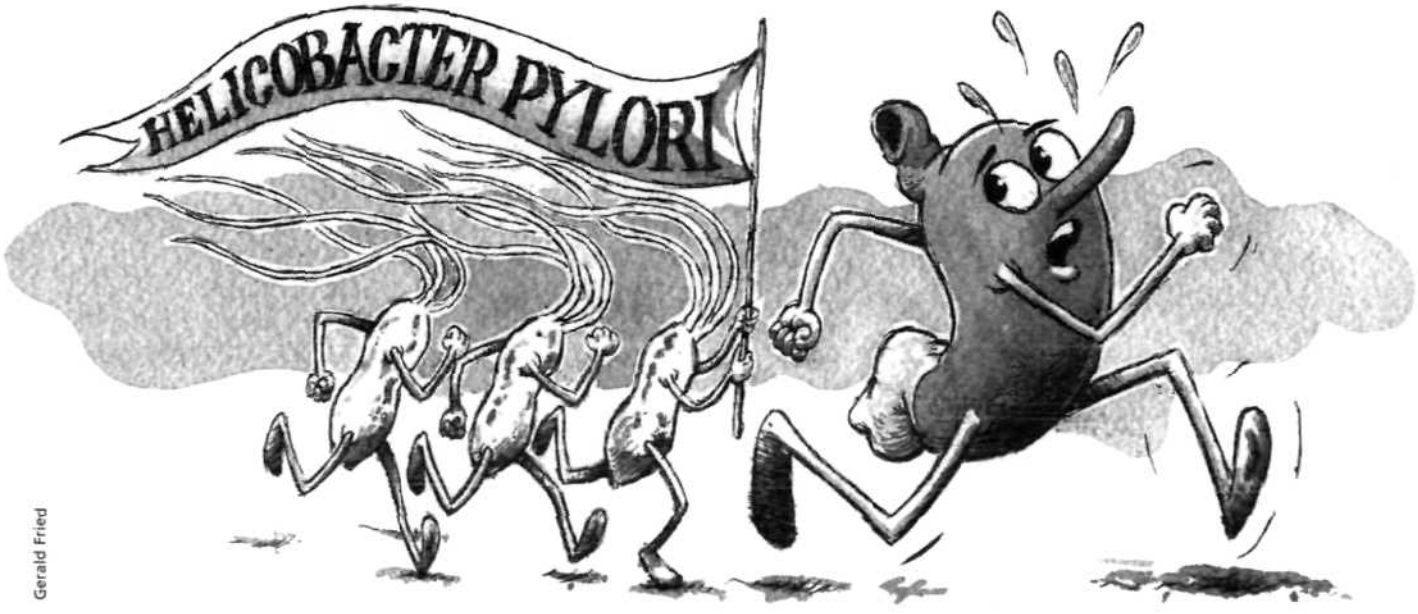
What ultimately convinced the medical world was not this sort of experiment but one that took advantage of the existence of effective antibacterial agents. To introduce the history of this effort, it is necessary to consider the setting in which it was done. As mentioned, there were already highly effective treatments for PUD by the early 1980s. The rate of complete healing of endoscopy-proven duodenal ulcers, after several weeks of treatment with potent inhibitors of acid production, is about 95 percent (Straus 1996). Symptomatic relief occurs within a couple of weeks (McFarland et al. 1990). Such treatment, moreover, is remarkably safe and free of side effects. The same cannot be said for metronidazole, the first widely used antibiotic for *H. pylori*. This and other proposed antibiotic treatments for *H. pylori* have unquestioned side effects, some of which mimic the symptoms of the very disease for which they are prescribed. These can pose significant disincentives for patients who would like to feel better. The selection of strains of *H. pylori* that are resistant to antibiotics, moreover, was reported in the very first large trial of their use. Does any of this sound promising for such a treatment?

I'm playing the devil's advocate. I am a firm believer in the *H. pylori* hypothesis, and if I had a duodenal ulcer, I would take metronidazole in a heartbeat. This was far from obvious throughout the 1980s, however, not because of dogmatic rejection, but for legitimate scientific and medical reasons. To summarize: Even by the end of the decade, it was not clear either that *H. pylori* caused PUD or, if it did, that specific antibacterial treatment would be preferable to existing treatments.

What finally convinced doubters of both cause and treatment was something that by its very nature took several years to establish. The initial treatment of peptic-ulcer disease was not the problem. The problem was *relapse*. In patients whose ulcers have completely healed after treatment with acid-suppression only, 50–95 percent will recur within two years, although the percentage is much lower if acid suppression is continued indefinitely (Gough et al. 1984). We now know that if temporary acid suppression is coupled with eradication of *H. pylori*, the recurrence rate drops to 5–10 percent.

But consider the time required to complete a trial that could establish this fact. The trial alone requires following about 100 patients for many months (twelve to twenty-four, typically), because ulcer recurrence is the issue. Patient accrual in any clinical trial is not instantaneous but usually occurs over several months or more, and the trial is not complete until the last patient entered has been followed for the planned period. This time is in addition to the usual time required for planning, applying for and receiving grant money, applying for and obtaining human-studies approval, overcoming unforeseen technical obstacles, writing the paper, waiting for a response after submitting it to a journal, revising it based on reviewers' recommendations, revising it again based on copy editors' recommendations, and waiting for ultimate publication. Thus, the least amount of time for such a project to proceed from inception to publication is about four years.

The first trial that was both large enough and rigorous enough to be noticed was conceived by Marshall and Warren in 1984 and published in *Lancet* at the very end of 1988 (Marshall et al. 1988). It had followed 100 patients for twelve months. The authors reported that the recurrence rate of duodenal ulcer was much lower in patients whose *H. pylori* were eradicated than in those whose bacteria were not, but there were problems. Such eradication occurred only when the antibiotic tinidazole was combined with bismuth. When tinidazole was given alone, resistant *H. pylori* strains invariably



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thrived. The authors also reported more unpleasant side effects, including diarrhea, in the groups that took the antibiotic. Thus the results were highly suggestive that eradicating *H. pylori* could prevent ulcer recurrence, but somewhat less suggestive that this could be done effectively in the long run with minimal side effects. Since the authors were the original proponents of the bacterial hypothesis, moreover, any firm conclusions would first require confirmation by others. This was not ostracism; it was appropriate scientific skepticism.

By early 1992, at least three more studies had been published that, in the aggregate, convinced the academic medical world of the causative nature of *H. pylori* in PUD. The trial portion of the last and most influential of these was already underway by September 1988, well before Marshall and Warren's paper was published—further demonstrating the commitment of medical scientists to investigate the hypothesis. This study followed 109 patients for two years, using a triple-antibacterial regimen that was far more effective than that reported by Marshall and Warren. It found, unequivocally, that the recurrence rate of both gastric and duodenal ulcer was far lower in patients whose *H. pylori* had been eradicated. Antibiotic resistance was not apparent because of the triple-drug regimen, and side effects were tolerable (Graham et al. 1992).

This study, according to Lawrence S. Friedman, chair of the American Board of Internal Medicine Subspecialty Board on Gastroenterology, opened the floodgates in the United States. "After that everyone accepted the causative role of *H. pylori*, and everyone, at least among gastroenterologists, treated PUD with antibacterials." According to Dr. Friedman, this was done for duodenal ulcer [DU] even in the absence of specific proof that the patient harbored the organism: "Early on (early 1990s) all patients with duodenal ulcer were assumed to have *H. pylori*; the presence of a DU was justification for treatment of HP, though in practice many physicians still tested for the organism (at endoscopy and to some extent by serology)" (Lawrence Friedman, personal communication).

In case there were still pockets of resistance to the *H. pylori* argument, the National Institutes of Health (NIH) convened a Consensus Conference in February 1994. Marshall was a member of the planning committee. The proceedings were published the following July in the *Journal of the American Medical Association* (NIH Consensus Conference 1994). The report strongly supported the causative role of *H. pylori* in peptic ulcer disease, and unequivocally recommended triple antibacterial treatment for patients with ulcers and *H. pylori*. It also enthusiastically supported further research on the organism and its potential role in cancer of the stomach.

How to Explain the Myth?

That, then, is the history of the *H. pylori* hypothesis and its acceptance by the medical mainstream. Its journey from proposal to acceptance was quite ordinary. The first reports were surprising but intriguing and entirely plausible. The potential implications didn't require a "new paradigm," just a little work. Other investigators quickly jumped on the research bandwagon, and in a matter of a few years, the basic story and its therapeutic ramifications were established. The profession, as represented by its literature and institutions, readily accepted it. The entire process took about eight years—ten, if one insists on including the NIH coming-out party (I don't), but not the thirteen that has been claimed. This amount of time was entirely appropriate, given the nature of the task.

So why the myth? I don't know how it started, but there are a couple of clues. Dr. Gerritsen refers to the Centers for Disease Control and Prevention (CDC) "putting out the word" in 1997. Is it possible that she is remembering the NIH Consensus Conference but got the date wrong? Probably not, because the CDC is not the NIH, and the CDC did publish a report on the topic in 1997. The word that it put out, however, was not "to the nation's doctors that . . . *Helicobacter pylori* was, indeed, the cause of most cases of peptic ulcer disease." On the contrary, it reported that national surveys in 1994 and 1996 had found that 90 percent of primary-care physicians and gastroenterologists in the U.S. already "identified *H. pylori* as the primary cause of PUD." The actual point of the article was to show that "only 27 percent of the *general public* [emphasis added] is aware of the association between *H. pylori* infection and PUD" (CDC 1997). Ironically, 60 percent of the general public still thought that the cause was "stress," a vague, whimsical, and mildly insulting "mind-body" hypothesis that medicine hadn't taken seriously for at least a generation.

To be fair, I will add that the CDC report also mentioned that although most physicians were aware of the *H. pylori* association, many of them (50 percent of primary care docs and 30 percent of gastroenterologists) were still not testing for *H. pylori* in patients with first-time ulcer symptoms. Rather, they were simply treating these patients with acid-suppressors. Ulcer symptoms, however, do not ulcers make. Such symptoms are frequently vague and nonspecific to ulcers *per se* and are similar to the far-more-common symptom complex known as "dyspepsia." Since the NIH consensus panel had specifically recommended not treating *H. pylori* in patients with dyspepsia but no ulcer, even when *H. pylori* was known to be present, it could be argued that these physicians were merely practicing cost-effective medicine: treating first-timers with a safe and inexpensive agent known to both heal ulcers and relieve symptoms promptly in the vast majority of cases while reserving the more invasive and expensive tasks of diagnosing both ulcer and *H. pylori* only for patients whose symptoms recurred after treatment was complete. While this does not refute my thesis, it may explain Dr. Gerritsen's memory of the report.

A bit of digging reveals that Marshall himself has had a hand in nurturing, if not creating, the myth. I tried to contact him to comment for this article, but he has not replied. Most of what I can glean from his Web page makes me think that he and I agree on important issues. For example, he lists Quackwatch, the most useful "CAM" information site on the Web, as one of his favored links (Barry Marshall 2004). (Disclosure: I have several pieces on Quackwatch and collaborate with its creator, Dr. Stephen Barrett, as co-host of the subsidiary NaturoWatch.) Marshall also links to a great debunking of "stress," which I hadn't previously seen (Spencer 2002).

And he has, quite evidently, a good sense of humor.

Nevertheless, there seems to be a bit of the self-promoter about him. I say this good-naturedly and with an affectionate nudge, imagining that someday we may meet and chuckle together. But also linked to his Web site is a 1997 article in *The Sydney Morning Herald* that sets the stage of his humble Western Australian beginnings on a dirt floor in a mining town and then bursts with suggestions of eventual Galileo-like ostracism by the vested interests of the drug industry and the "conservative world of medicine": "Everyone knew that bacteria couldn't survive in the stomach's acid environment. They'd been taught so at medical school" (Sweet 1997).

Huh? Everyone who has taken a microbiology course in the past few decades is aware that there are bacteria adapted to conditions far harsher than inside the stomach, including some that live at near-boiling temperatures and others that use ether—usually a powerful disinfectant—as a food source. Everyone who has studied histology and physiology knows that changes in the body's microenvironment, including acidity, can be dramatic over very small distances (measured in microns). The means by which *H. pylori* withstands the stomach's acid environment have been largely elucidated. The organism has a membrane that is particularly impermeable to acid. The membrane also contains acid-dependent urea channels that begin to admit urea from the stomach juices when the pH is a mere 6 (10,000 times less acidic than the normal stomach pH of 2). The urea is then rapidly transformed to ammonia via the enzyme urease, which the bacterium produces in abundance. Because ammonia is a base, this produces a tiny region of non-acidic space within which the bacterium dwells (Sachs et al. 2003).

Although these mechanisms were not known at the time that *H. pylori* was discovered, the plausibility of such mechanisms existing was never an issue. To argue otherwise is to conjure a "straw man." After all, similar organisms had already been described in the equally acidic stomachs of other mammals. The only questions that investigators in 1983 asked were: Are the bacteria really there, and if so, what do they do?

Marshall, who was interviewed for the *Morning Herald* article, offers no clarification when the reporter writes, "Marshall took at least a decade longer than he expected to persuade colleagues that ulcer patients with *H. pylori* should be treated with antibiotics" (Sweet 1997). That may be, but it wasn't because of ostracism. Marshall had previously written, in a technical monograph, "In my naïveté I expected *H. pylori* to be immediately accepted as the cause of duodenal ulcer," [but] "the presence of *H. pylori* in many apparently healthy persons has made its pathogenic role harder to understand and has delayed wide acceptance of the new bacterium as an important pathogen" (Marshall 1991).

Another link from Marshall's Web site is to a radio interview in which he and others discuss the history of *H. pylori*, particularly with regard to its several near-discoveries prior to Warren's finding in 1979 (four years before the letters in the *Lancet*). In that interview is this telling exchange among three people: Sharon Carleton (the moderator), Irvin Modlin (a gastroenterologist from Yale), and Marshall.

> *Sharon Carleton:* One component you don't mention is finance, money. How much influence do you think the drug companies have had in the past in trying to keep the truth at bay, or was it really primarily the medical establishment itself?
>
> *Irvin Modlin:* I think those two components are almost inseparable; there's little doubt in my mind that in a world where ulcers had been declared to be acid-related, corporations that were involved in the manufacture of acid-suppressive agents didn't want to even conceive that there would be any other possibility for the pathogenesis of peptic ulceration. And of course, many of the people who were in a position to evaluate any other possibilities were heavily indebted to corporate support for their own research work and were, I think, not necessarily overtly but in a sort of covert or subtle way influenced to almost look the other way.
>
> *Sharon Carleton:* In his own chapter in the book, Barry Marshall asks rhetorically, was there a conspiracy to keep the

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H. pylori story under wraps? His answer—yes. But this was fired more by inertia and bad advice than by the drug companies' malice.

Barry Marshall: Well, you have to take pity on them because one particular company who's now in the *H. pylori* business with everybody else was Glaxo, and after the helicobacter meeting that we had in Chicago one year, their stock dropped from $20 down to $18 which represented about a billion dollars off the value of their company (ABC Science 2003).

What's missing from this pharmaceutical conspiracy theory is evidence that drug companies were successful in suppressing *H. pylori* research, even if this was their intent. The effectiveness of the "covert or subtle" means suggested by Dr. Modlin is simply not supported by the historical record, a fact that Dr. Marshall appears to have acknowledged. But it seems that even as Marshall equivocates when his champions trumpet conspiracy theories, he coyly encourages them. And yet, to paraphrase Galileo, medical science *does* move. It is my hope that Marshall the Quackwatch fan will read this article and recognize that his nurturing of the myth has given unintended succor to quackery.

Thus, the basis for the challenge remains untainted. The legend of *H. pylori* and peptic ulcer disease was a good try, because it is so widely believed, but it fails to stand up to scrutiny. In this case, as in modern medicine in general, progress resulted from the vigorous investigation of a plausible hypothesis—even if there was early skepticism and even if certain "vested interests" may have preferred otherwise. That said, I respectfully urge any remaining doubters to conduct their own research prior to submitting further nominees for exceptions to this rule.

Epilogue

An interesting article appeared in *New Scientist* a couple of years ago. It turns out that *H. pylori* lives in "around half the world's population" and "in parts of the developing world as many as 90 percent of the population carries the bug," but "only a fraction of these people ever get sick" (Hamilton 2001). Thus it may be a commensal after all. Of more concern is that it may protect against esophageal cancer, a disease that is recently on the rise even as rates of *H. pylori* carriage are falling. The question of whether it is wise to eradicate *H. pylori* thus remains open. Such is the nature of science: to march on. To Marshall's credit, I found the article linked from his own *H. pylori* laboratory Web site (*Helicobacter pylori* Research Laboratory 2004).

Acknowledgement

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Science and the Public

Is Science Making Us More Ignorant?

The attempt to integrate basic cultural beliefs with the scientific outlook calls for a new interdisciplinary academic field. Such a field could contribute to the debate over public literacy in science and help motivate public support for science.

AUSTIN DACEY

Is science making us more ignorant? Surely, scientific knowledge is increasing. In a year, we will know more, and in richer detail, about the universe than we do now. In one sense, the scientific ignorance of laypeople increases with each increase in specialists' knowledge, since most laypeople can't keep abreast of advancing science. But even if everyone were scientifically informed, that would not keep us from being ignorant in the following sense. We still might be lost, in that we might not have a reasonable grasp of basic issues like these: What are we? Why are we here? How are we related to nature? Why is this world here rather than some other world or "nothing at all?" What can we know? What can we hope for? A person who could recite the periodic

table and explain the difference between introns and extrons but who had nothing to say on questions like these would be out to sea intellectually.

Throughout most of human history, people have gotten a handle on such questions by way of common sense, religion, philosophy, literature and art, educational and civil institutions, and assumptions embedded in natural language itself—in short, by way of their *culture*. Of course, a single culture might contain many, sometimes conflicting, answers. Nevertheless, there is such a thing as a cultural understanding of our basic outlook on the world and our place in it.

Today, this understanding is being unsettled. Emerging science clearly speaks to central cultural questions, but precisely what it says is unclear. This is an opportunity for a new line of inquiry, rooted in a new multidisciplinary academic field with tremendous intellectual and social significance. It could help point the way to renewed support for publicly funded basic research and decide what sort of "science literacy" matters most.

The Loss of Cultural Understanding

Consider the question of what we are. One way to approach this question is through a complex of cultural beliefs about the self; for instance, that it is a coherent, unitary entity, mostly transparent to introspection, which authors behavior by the free directives of its will. Now, neuroscience is probing the brain and behavior and discovering some startling facts. By observing electrical activity around your hippocampus on a computer screen, others can predict more accurately than you can whether you will successfully recall the name of a person you just met. Meanwhile, the neural activity associated with a choice appears to *precede* your conscious experience of that choice. This is just the beginning. Do these facts contradict the received cultural understanding of the self? Do they reinforce it? Or are they not facts about the self at all but about something else? I don't know. I'm not sure that anyone does at this point.

And that is how science is making us more ignorant. Before neuroscience, the received cultural understanding of the self was reasonable because it was favored by the balance of the total evidence available to us. That evidence included our own introspection, along with the cultural sources just mentioned. We had an idea of what was going on with the self. With the advent of neuroscience, the total evidence available to us came to include the results of the investigations of that field. Yet we don't know what this expanded set of evidence should lead us to conclude with respect to our cultural beliefs about the self. Thus, we have become more ignorant about the self. The point is not that some people don't yet understand the latest relevant science. Rather, the latest science makes it the case that we no longer understand what we once did about the self. A similar case can be made for each of the basic cultural questions mentioned above.

Someone skeptical about the reach of science might reply that neuroscience research is not a proper part of the total evidence relevant to understanding the self. However, such research clearly *appears* relevant. Maybe the appearance is misleading, but no one has established that it is. Until this is established, basic pieces of culture remain up for grabs. In a prescientific environment, we could discharge our epistemic duties with respect to our cultural beliefs without thinking about science. To do that now would be to ignore a part of the total evidence relevant to those beliefs. And that would be ignorant.

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A New Field of Inquiry

The positive way to say that science is making us more ignorant is to say that it is opening up a new field of inquiry. There are different ways to frame this field. For reasons that will emerge below, I frame it as "science and the public." I see it as having philosophical and empirical-sociological aspects. The philosophical aim is to articulate the relationships (logical, conceptual, epistemological, normative) that hold between emerging scientific knowledge and basic cultural beliefs and values. The empirical-sociological aim is to examine how these relationships play out in the interactions of actual participants in the culture, namely, institutions of science and technology and the public. We are familiar with the idea that science has technological and medical applications. But it also has *cultural applications*. The field of science and the public can also be thought of as the study of the cultural applications of science.

The general idea of bridging science and culture is nothing new. However, the present notion of science and the public is distinctive. Perhaps the two thinkers who loom the largest in this area are C.P. Snow and E.O. Wilson. In a now-famous, 1959 lecture, Snow decried the gulf between the "two cultures," with literary intellectuals and artists on the one side and scientists and technologists on the other.[1] He was worried that academics were not talking to each other across these disciplinary fences. Snow was right to be concerned, and his concerns remain timely today. We can go further than Snow, however. Basic cultural understanding, common to literary and scientific types alike, is being upended by the growth of science. Reconstructing it will require the cross-disciplinary work of scholars in the sciences and the humanities.

The contemporary scientific outlook is widely presumed to be materialist or physicalist, in that all properties and relations in the universe (or universes) are thought to depend in some way on the fundamental wave-particles and forces postulated by physical theory. This presents a problem, for there are plenty of things in the world that we regard as real—intentions, promises, jealousy, friends, toll roads, federal constitutions, and so forth—yet they appear in no physical theory. What are we to make of them? That is, how are we to systematically relate our commonsense and cultural ontologies to physicalist ontologies? One solution is so-called intertheoretic reduction: "higher-order" entities are "nothing but" agglomerations of "lower-order" entities, and the laws governing the former can be deduced from the laws governing the latter. This was the bold agenda championed by E.O. Wilson under the banner of *consilience*, the idea that "all tangible phenomena, from the birth

of stars to the workings of social institutions, are based on material processes that are ultimately reducible, however long and tortuous the sequences, to the laws of physics."[2]

Unfortunately for Wilson, this reductionist program has long since been abandoned because of insurmountable technical obstacles, even in the case of reducing biology to chemistry.[3] Reductionism is dead, whereas nonreductive integration is very much alive.[4] Throughout the fields of philosophy, cognitive psychology, linguistics, even theology, researchers are attempting to systematically relate their subject matter to the ontologies emerging from the natural sciences. The field of science and the public would draw these disparate research projects together, offering a coherent overview (inasmuch as the overview turns out to be coherent).

The Role of Academia

To date, there are no major academic institutions devoted to studying the cultural applications of science. Traditional training in formal-science teaching tends to focus, quite appropriately, on science as a body of knowledge or set of methods. In the U.S. and in the United Kingdom especially, there are also thriving academic programs in the field known as "science communication" or "public understanding of science," for instance, the programs at Cornell University and the London School of Economics. These programs typically consist of sociological examination of the public's experience of science, especially as mediated by mass communication. Programs in the history of science and technology, such as the initiative at MIT, look at the social repercussions of science and technology over time. None are primarily concerned with the intellectual and normative connections linking the scientific outlook with cultural beliefs and values. Many analytic philosophers are taking naturalistic, scientifically informed approaches to semantics, the mind, morality, and other issues. The task of synthesizing these independent lines of inquiry has for the most part been left to others.

A new interdisciplinary academic field is needed. The Center for Inquiry, a nonprofit research organization concerned with the scientific outlook, is collaborating with the University at Buffalo on a program in Science and the Public, which will initially include research and an interdisciplinary Master's degree.[5] The program is being designed to attract scholars in the sciences and humanities, as well as educators, policy makers, and journalists who seek a new language and framework in which to discuss the intersections of science and culture.

The subject of science and the public is related to, but distinct from, the subject of public science literacy. Scholars and policy experts continue to disagree about what kind of science literacy is desirable and how to promote it.[6] Not even scientists and science educators, much less laypeople, have a comprehensive grasp of the fundamental principles and findings of all fields of contemporary science.[7] It may well be that the findings are just too numerous and complex, and the principles too nongeneralizable; there is simply more scientific knowledge than even a reasonably intelligent and well-educated person could become competent in (and there is good inductive evidence that this situation will continue into the foreseeable future). As a workable alternative to this ideal of science literacy, we might look toward the public's appreciation of the scientific outlook's import for basic cultural beliefs and values. Further, one of the things that most disturbs science educators, especially in the U.S., is the high level of public belief in pseudoscience, the paranormal, and the supernatural: ghosts, demons, reincarnation, creationism, psychic abilities, and so on. Yet no one has successfully demonstrated that traditional education in science tends to reduce such beliefs generally.[8] With its focus on cultural implications, the science and the public approach engages them directly.

One of the things that most disturbs science educators, especially in the U.S., is the high level of public belief in pseudoscience, the paranormal, and the supernatural: ghosts, demons, reincarnation, creationism, psychic abilities, and so on. Yet no one has successfully demonstrated that traditional education in science reduces such beliefs.

Leading colleges and universities may be beginning to rethink the place of science education in their core undergraduate curricula. The 2004 *Harvard College Curricular Review* by the Faculty of Arts and Sciences noted: ". . . our undergraduates will live in a world of ongoing scientific and technological revolution. We are revising our understanding of the biological infrastructure of life, and challenging conceptions of human nature and of our physical universe. . . . We must prepare not only science concentrators but also those students more interested in the humanities and social sciences to grapple with the scientific and technological elements of the public policy issues and ethical questions that will arise in their lifetimes."[9]

The *Review* concluded that students should grasp the foundational principles, methods, and institutional culture of the sciences; broad-based survey courses alone are insufficient. A reinvigoration of science's role in a liberal-arts curriculum, of the kind being considered by Harvard, will benefit from serious reflection on the relationships between science and culture. It is precisely this reflection, I am arguing, that deserves a specially dedicated academic effort.

The Search for a New Public Science Policy

Aside from its intrinsic interest, the field of science and the public could play an important role in securing public support for science. The architects of twentieth-century American science policy saw that basic scientific research would require public—i.e., governmental—support. The received policy dates to the closing years of World War II, when leading scientists sought to continue the partnerships between academic, business, and military communities that had been forged during wartime. In 1945, President Roosevelt commissioned a report that would come to structure American science policy for the next fifty years. *Science: The Endless Frontier*, authored by Carnegie Institution president and electrical engineer Vannenar Bush, made the case for securing government funding for "basic research" (by which he meant research guided by theoretical rather than practical considerations) while relaxing wartime controls and security constraints. The report led to the creation of the National Science Foundation five years later.[10]

The received science policy served the country's national interests throughout the eras of Sputnik and the H-bomb. It also made the United States the world's leading contributor to the global commons of scientific information, an enormous wealth of data that are copyright-free and open to all for further study and applications. Throughout most of the history of the U.S., a liberal regime of copyright law reinforced the scientific ethos of information sharing. Data as such were not eligible for copyright protection and immediately entered the public domain upon publication. Other researchers could protect specific scientific publications that used or compiled the data, while the data itself remained non-copyrightable, along with any "idea, procedure, process, system, method of operation, concept, principle or discovery" found in a scientific work.[11]

This legal infrastructure has come under stress at several points. The commercialization of biochemistry by the pharmaceutical industry is the most pressing. Corporate-funded researchers bury the results of clinical trials when they are found to be unfavorable to their sponsors, depriving public science of crucial data.[12] Drug companies block cheap generics desperately needed in the developing world, insisting on an inflexible intellectual-property system in the face of a staggering humanitarian toll.

Less noticeably, the proportion of government-funded to private-funded research and development has fallen from a high of sixty-seven percent in the 1960s to twenty-six percent in 2000. The universities, traditional centers for the production of public basic science, are especially vulnerable to financial pressures. The Bayh-Dole Act of 1980 encouraged schools to commercialize the applications of research, even when it is federally funded. Some observers see funding "shifting from military-related physics and chemistry to commercially oriented molecular biology applications, chiefly for agricultural and drug corporations. In many leading universities, a new pharmaceutical-corporate complex is slowly displacing the older military-industrial complex. . . ."[13]

Meanwhile, with the rise in digital media for disseminating information, have come new opportunities to own and control it. Under the 1996 European Union Database Directive and similar proposals put forward in the U. S., the maker of a database is granted a new *sui generis* property right to all the information it contains. In general, when information is accessed via computer software, the creators of that software have the power to limit access even when such access would be permitted by the copyright. In this digital environment, copyright holders' *controls* can easily outpace their *permissions*.[14]

Where Vannenar Bush feared the meddling fingers of short-sighted bureaucrats, today, it is the market's invisible hands that are bending science into a narrowly utilitarian shape. Surely, any sensible knowledge economy must provide incentives to private interests to invest in innovative science and technology. But these incentives must be weighed against the great public interest in free and open basic science. Its flourishing will require a new commitment of public support, a new contract between science and society.[15]

As the Cold War did a generation ago, an open-ended "war on terrorism" might justify federal spending on certain fields, such as bioinformatics—but what of evolutionary ecology or neurobiology?[16] Practical arguments for noncommercial applications might support investment in some sciences, such as climatology—but what of cosmology or theoretical physics? Here the cultural applications of science may help point the way to a post-Cold War defense of publicly funded basic research. The cultural project of self-discovery, once carried out in the solitary introspections of a Descartes or Luther, now animates research programs enlisting dozens or hundreds of people and resources from around the globe. In an age of science, cultural knowledge isn't cheap. And like knowledge in general, it is a public good. In the terms of economic theory, its use is non-rivalrous—once the good has been produced, the marginal cost of providing it to each additional user tends to be low to zero—and it is non-excludable—preventing anyone from using the good without preventing all is impracticable or impossible.[17] Like other public goods, knowledge invites "free riders," making it unattractive to private investors seeking financial returns. Citizens who care about basic cultural knowledge should care about public investment in fundamental science.

Conclusion

Science doesn't shed only light. It also casts shadows, splintering the "clear and distinct ideas" of Cartesian intuition and the "inner light" of conscience into a thousand variegated shades. If we look carefully into this dappled array, we can make out the beginnings of a new cultural understanding of ourselves and our place in the world. To make sense of it, we will need a field of inquiry that examines the intersection of the scientific outlook with fundamental cultural beliefs and values. Attention to science and the public could also help refocus the debate over science literacy and motivate public support for basic research in the post-Cold War era.

Acknowledgements

I wish to thank Camilla Dacey-Groth, Elizabeth Harman, Paul Kurtz, and Christopher Whittle for their comments.

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Why SETI Is Science and UFOlogy Is Not

A Space Science Perspective on Boundaries

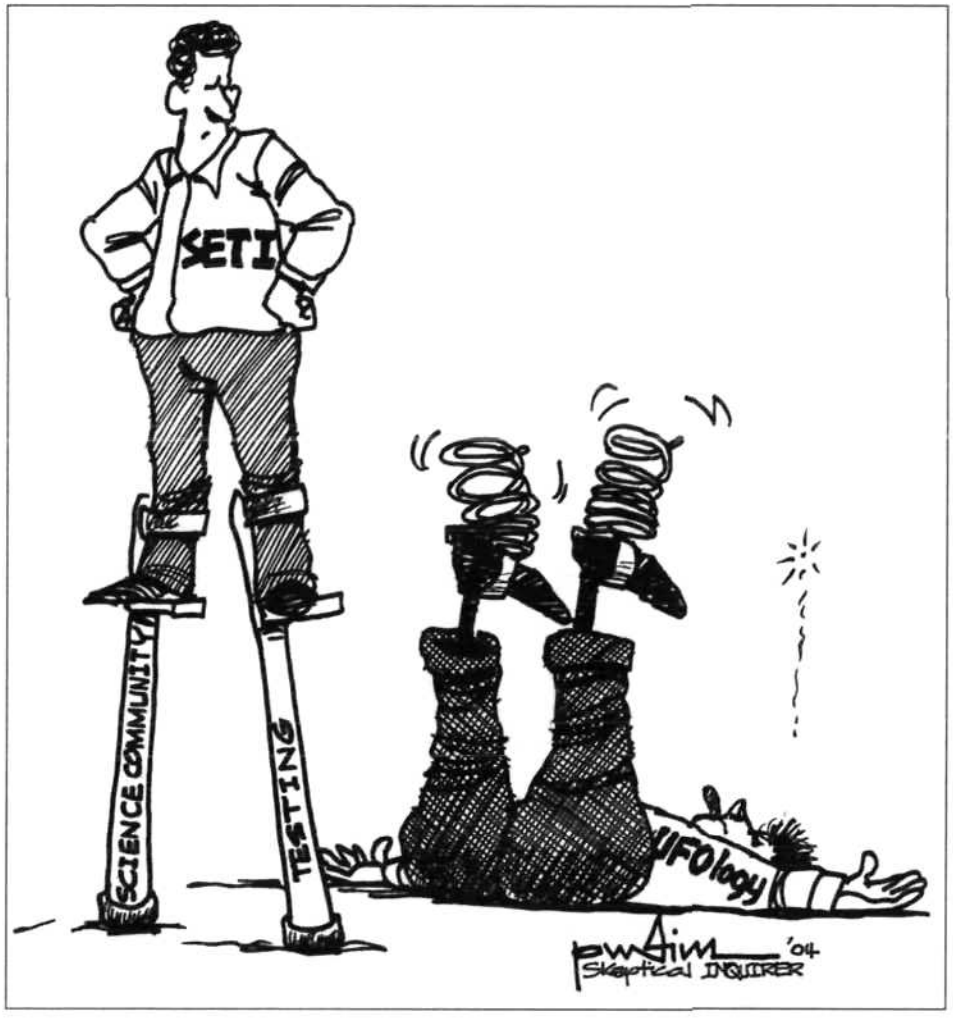
Understanding the differences between science and pseudoscience is a fundamental critical thinking skill but often isn't as easy as it sounds. Using SETI and UFOlogy as case studies, a space scientist examines what is meant by science *and why some highly speculative ideas are part of the scientific mainstream while others are not.*

MARK MOLDWIN

One of the goals of science education is to provide the critical thinking skills that are necessary to distinguish fact from fallacy, legitimacy from fraud, and science from pseudoscience. Scientifically literate people understand how science works and does not work, how to identify strengths and weaknesses in arguments, and how to critically examine data in order to make decisions despite uncertainties. So how does one define the differences between science and pseudoscience? To the discomfort of many, the line can be fuzzy. Like the old saying about pornography, rational thinkers like to believe they know pseudoscience when they see it.

Often, the argument is posited that science follows the

scientific method (in fact, some hold that this Baconian idea is the definition of science) whereas pseudoscience does not. This is clearly not the case, as readers of SKEPTICAL INQUIRER know, since many pseudoscientific claims are routinely put to the scientific-method test, and debates rage on the results of studies that purport pseudoscientific claims published in the scientific literature (e.g., an article about "memory water" that ran in *Nature* [Davenas et al. 1988], another on the power of intercessory prayer in healing that ran in the *Archives of Internal Medicine* [Harris et al. 1999], etc.). Often, referees and editors cannot find any methodological errors in the studies despite having the results fly in the face of conventional science. The critics are then left to insinuate fraud, observer bias, or improper controls.



If science is not defined by the scientific method, how can one differentiate between science and pseudoscience? Philosophers of science have long considered this "demarcation" problem (see, for example, Bunge 1984). As a working scientist, I suggest two characteristics of science that can be used to make that distinction. The first deals with the community of scientists, and the second goes to the essence of science—namely the constant testing of any scientific idea against reality. The first, the willingness of scientists to practice as part of the community of science, means having the appropriate educational credentials, undergoing peer review of proposed scientific ideas, discussing ideas at scientific meetings and conferences, and presenting results for peer review in respected journals. Those who attempt to practice outside the scientific community, called "scientific hermits" by Martin Gardner, attempt to avoid a critical assessment of their ideas. What they're attempting to avoid is the second characteristic of science in this discussion: namely, the constant testing of scientific ideas compared to previous understanding and observations. This testing has been described as subjecting an idea to "reality therapy" (Bauer 1992) and allows science to make universal statements agreed upon by all practicing scientists.

SETI and UFOlogy

As an illustrative example, let us examine the difference in attitudes toward SETI and UFOlogy in the scientific community. Slowly, over the last few decades, the search for extraterrestrial intelligence (SETI) has been given the imprimatur to join the ranks of legitimate science. In 2003, the SETI Institute was named a member of NASA's Astrobiology Institute (www.seti inst.edu) after a rigorous peer-review process. In addition, a search of Harvard's Astrophysical Data System for the keyword SETI listed over 600 refereed-journal articles, indicating the vigor of this research area. One of the premises of SETI is that life may have evolved elsewhere in the universe and some of that life may be intelligent enough to utilize electromagnetic radiation as a form of communication. Therefore, a systematic search of the sky in radio (or even other wavelengths) for evidence of intelligent life is justified.

The search for UFOs, on the other hand, is derided as pseudoscience, even though UFOlogists may consistently practice according to the scientific method (i.e., seek confirmable observational evidence, systematically discuss sources of error, etc.) and share a similar premise with SETI researchers—namely that intelligent life may have evolved elsewhere in the universe. Why the difference in the legitimacy of the two endeavors?

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SETI is part of the community of astronomy or astrobiology and is practiced by astronomers, physicists, and geophysicists. The methodology of SETI leads to useful scientific results even in the absence of discovery of intelligent life. In fact, the stated mission of the SETI Institute is "to explore, understand, and explain the origin, nature, and prevalence of life in the universe" a broad goal not predicated on the existence of other intelligent life in the universe.

In trying to clearly differentiate between science and pseudoscience, one often needs to go beyond each field's methodology and look more closely at its sociology and the willingness of its practitioners to constantly compare and test their ideas against our current understanding and observations.

UFOlogy *is not part of the community of astronomy,* astrobiology, or any other discipline, and its methodology, no matter how scientifically rigorous, will lead to no useful scientific results except in the singular case of the discovery of an alien spacecraft. One could argue perhaps that if UFOlogists became part of NASA's Near-Earth Object (NEO) community (the community of astronomers and geophysicists attempting to identify comets and asteroids) they would gain some legitimacy. However, most UFOlogists already claim evidence of ET visitations and expound on the conspiracy of mainstream science to hide their revelations as opposed to actually searching for evidence.

Reality Therapy

Another way to understand why it can be difficult to differentiate science and pseudoscience is to appreciate that there is a spectrum of science. Established, or "textbook," science has successfully stood the test of time to explain nature (it has been subjected repeatedly to "reality therapy"). There is also new science, sometimes called frontier science, which is made up of the recent discoveries, the new conjectures, and the latest proposals for extending current knowledge. Interesting frontier science is the science that makes *The New York Times* science page and often appears on the evening news. What scientists know, and the general population often does not, is that frontier science is frequently wrong. For example, the recent coverage of doomsday asteroids heading to Earth eventually became just another close call (see www.space.com/science astronomy/asteroid_scares_030909.html).

It takes time for frontier science to be examined and either validated or rejected (i.e., undergo reality therapy). Only after frontier science has successfully made its case does it slowly make its way into mainstream scientific thought. SETI began as frontier science. The hypotheses that there are other planetary systems; that some of these systems may have Earth-like planets; that life may be ubiquitous; and that, given enough time, intelligent life may have evolved elsewhere have each been analyzed and in some cases confirmed (e.g., we now have observed other planetary systems). UFOlogy can trace similar roots but goes a step further and suggests that intelligent life elsewhere has somehow been able to overcome interstellar distances to send physical probes to Earth.

So when one looks at the difference between SETI and UFOlogy, the two main differences are that *SETI operates within* the community of science whereas UFOlogy does not and that several SETI ideas have been explored observationally and validated. In addition, the premise of SETI is more likely (though still highly speculative) compared to UFOlogy, simply because it is more plausible to imagine a civilization communicating across interstellar distances with electromagnetic radiation rather than sending a physical ship with intelligent living beings. Of course, if an alien craft landed on Earth tomorrow, UFOlogy would instantly join the mainstream. Therefore, the boundary between pseudoscience and science is not necessarily immutable.

In trying to clearly differentiate between science and pseudoscience, one often needs to go beyond each field's methodology and look more closely at its sociology and the willingness of its practitioners to constantly compare and test their ideas against our current understanding and observations. Do they allow their work to be scrutinized and criticized by their scientific colleagues? Do they publish in peer-reviewed scientific journals? Have any advances in their field made it into scientific textbooks? The answers to these three questions are often good indicators of whether an area of study belongs in the realm of science or pseudoscience.

Note

The motivations for writing this essay were discussions in an undergraduate course at UCLA that I taught in the fall of 2002 and reading H.H. Bauer's *Scientific Literacy and the Myth of the Scientific Method.*

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Blind Spots, Brain Maps, and Backaches

A New Chiropractic Delusion

A new test that measures the size of the blind spot to detect altered brain function and correct it with chiropractic adjustments is a house of cards built on flawed logic and one unbelievable experiment.

HARRIET A. HALL

My trip down the rabbit hole started when an ad in the newspaper caught my eye: "Do you have a good brain or a bad brain? One simple test may tell you . . . call today for a free brain exam." I started to worry. I had always thought I had a pretty good brain, but what if I was wrong? Would a bad brain mean I was evil, or just that I was developing Alzheimer's? What kind of brain exam could tell me that? I was intrigued, so I called the number. It turned out to be a chiropractor's office. Now I was even more intrigued: I thought they did backs, not brains. They explained that they could tell if one side of your brain was malfunctioning by mapping the blind spot in each eye. Then they could adjust the proper side of your neck to correct the problem.

That didn't make any sense to me, but maybe I slept through that lecture in medical school. I am always eager to learn new things, so I asked the chiropractor where I could read more. He pointed me to a 1997 article in a chiropractic journal.[1] I later found out this one article was the *only* thing in print on the subject.

Oodles of ophthalmologists, numerous neurologists, many medical students, and untold others have looked at plenty of pairs of normal eyes, and have always found blind spots that matched.

The article was very impressive. It looked like real science. It was by Frederick Carrick, a Ph.D. as well as a D.C. (Doctor of Chiropractic). It was seventeen pages long, with diagrams, charts, statistical analyses, and forty-seven references. It described an elaborate experiment in which 500 volunteers were found to have a significant, reproducible difference in the size of the blind spots between their left and right eyes. It demonstrated that chiropractic manipulation of the proper side of the neck could shrink the enlarged blind spot; if you manipulated the wrong side, nothing happened. It concluded that it had found a new test of cortical (brain) function.

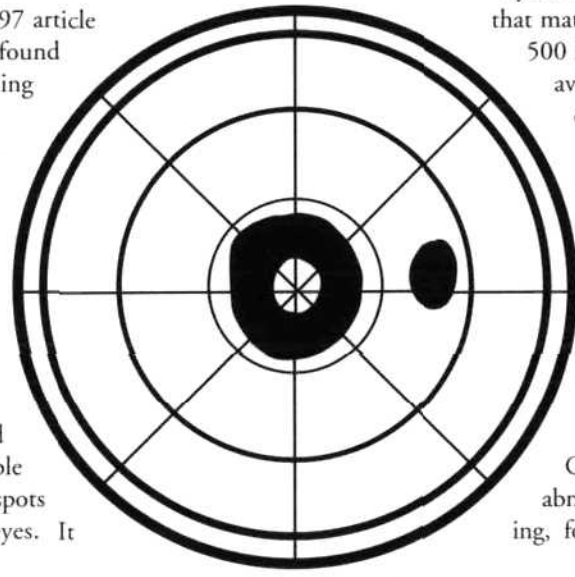

Figure 1. Visual field with abnormal pericentral scotoma (black circle at center) and normal blind spot (black dot at right).

Okay, I know what the blind spot is. The retina of the eye is covered with light receptors (rods and cones) except in the area where the optic nerve comes into the eye: that spot, lacking photoreceptors, is known as the blind spot. You don't notice it, because your brain fools you by filling in the vacant area with more of whatever the other photoreceptors nearby are sensing. The blind spot is a fixed anatomical feature. The only way it could physically enlarge is if the optic nerve itself enlarged. There are two ways it could *seem* to enlarge: damage to the retinal photoreceptors around the optic nerve, so that no light signals were picked up; or damage to the brain or the nerves connecting the eye and the brain, so that signals received were not processed properly. I couldn't imagine how adjusting the neck could affect any of those factors.

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Ophthalmologists have been mapping visual fields for many years. They get a picture for each eye that looks something like figure 1. In this example, the white areas represent what the patient could see, the black ring around the center is an abnormal finding, and the smaller black spot to the right represents the normal blind spot that everyone has.

In a normal person, the blind spots are approximately equal in size because the optic nerves are equal in size. Oodles of ophthalmologists, numerous neurologists, many medical students, and untold others have looked at plenty of pairs of normal *eyes, and have always found blind spots* that matched. In Carrick's study, they found 500 lopsided people, with one blind spot averaging half again as large as the other. This worried me. How could all those previous observers have missed such an obvious difference?

An ophthalmologist has to look at a lot of visual field tests to find one with an abnormally enlarged blind spot, and when he finds one he can almost always find retinal or other pathology to explain it. How many people did Carrick have to test to find 500 with abnormal blind spots? I went Web surfing, found his e-mail address, and asked him. All he could tell me was that they tested more than 500. All were students in Carrick's postgraduate neurology courses for chiropractors; how many students could he have had altogether? Even the most generous estimate would suggest that asymmetrical blind spots are common.

Another source I found on the Internet[2] said they found abnormal blind spots in 99 percent of those tested. How could 99 percent of people be abnormal? That Web site also left me wondering about a lot of other things, such as how they managed to confuse the anatomical blind spot on the retina with the blind spot where you can't see other cars in your rear-view mirrors. And how could a tap on the spine with the product they sell, a little spring-loaded "activator," fix anything in the spine, much less in the eye?

Maybe Carrick's test was better and he could pick up things the ophthalmologists' tests missed? Not likely. Ophthalmologists use sophisticated equipment; Carrick's test uses a paper and pencil. You can easily do your own test at home following these simple instructions:

1. Tape a piece of typing paper to the wall and stand twenty-eight centimeters (eleven inches) from the wall.
2. Place a dot in the center of the paper.

3. Cover one eye and fixate on the dot with the other eye.
4. Move a small target (the eraser on a pencil will do) from the dot horizontally in each direction.
5. Make a pencil mark where the target seems to disappear, and another mark where it seems to reappear.
6. Starting in the area where the target disappeared, move the target up, down, and at 45 degree angles until it appears again, and mark those spots.
7. Draw a rough circle by connecting the eight dots you have made.
8. Repeat for the other eye.

You now have a map of your blind spots (only your blind spots, not your brain function). If you find that one of your blind spots is half again as wide as the other, I would advise you to run, not walk, to the nearest eye doctor.

On the basis of this one study, more than 200 practitioners are now using this test clinically. Carrick heads the Carrick Institute for Graduate Studies and teaches the test in his postgraduate chiropractic neurology courses in various cities around the world. I asked him if there was anything else in print to justify using the test. He said other experiments were in progress, and in the meantime, I could learn more by reading the forty-seven references cited in his paper. I didn't find them very enlightening: I found most of them irrelevant or misinterpreted, and one said clearly that the blind spots were equal in size.

Carrick did not seem to notice that he had found something no other observer had ever found. When I tried to point this out to him, his answer was that his test was reproducible: two independent examiners had found the same results. I tried to explain to him that "reproducible" does not mean "valid." For instance, if you use a broken thermometer, you might reproducibly get the same results every time, but they wouldn't be valid—they wouldn't agree with a functioning thermometer. He didn't seem to think this concept applied to his research.

I tried the test at home on friends and family and none of them were lopsided. If I had found any significant difference, my next step would have been to cross-check my results with one of the standard visual field tests used by ophthalmologists. Carrick did no cross-checking. He reminds me of my great-grandfather: when he was in his nineties and almost completely blind, the kids handed him a basketball as a joke. He threw it once and, amazingly, made a perfect basket. They said, "Do it again, Grandpa!" He replied, "Nope. I don't want to break a perfect record."

I tried to convince Carrick that if he found "X" where every other observer had always found "not X," logically either he was wrong or all the other observers were wrong. Either both blind spots are the same size, or one is larger than the other; both statements can't be true at the same time. This is a problem. Until the conflict is resolved, it doesn't seem reasonable to forge ahead and use the new test in further experiments. But that's exactly what he did. He used his new blind spot test to show the effect of chiropractic manipulation.

He manipulated the volunteers' necks on the side of the enlarged blind spot and nothing changed. He manipulated their necks on the side of the smaller blind spot, and follow-up tests showed that the enlarged blind spot was smaller after treatment, essentially back to normal size. Results were reproducible and statistically significant.

If current medical science is right, nothing in the neck should have any effect on the size of the optic nerve where it enters the retina. What was going on here?

He concluded (without any supporting evidence) that he had found a way to map cortical (brain) function. One blind spot could be affected by manipulation on one side, so manipulation must affect the brain on one side, and the activity of that side of the brain must affect the size of the blind spot. Never mind the fact that medical science has never found any anatomical connections that would allow for that, or any rationale that would explain it. Never mind logic. You can express Carrick's reasoning as an illogical sillygism:

Let A=manipulation
Let B=change in brain function
Let C=decrease in size of enlarged blind spot
A is followed by C, therefore A causes B and B causes C.

Sorry, but this doesn't compute. It is no more logical than saying "washing my car is always followed by rain (eventually),

therefore clean cars make the Weather God angry and anger makes the Weather God pee rain."

I pointed out the logical fallacy to Carrick. He insisted that manipulation must affect the brain and the brain must affect the blind spot because nothing else would explain his results. I told him the fact that he couldn't think of another explanation didn't prove there wasn't one. I could think of a lot of other possible explanations for his results, and I gave him a long list of them, including lack of proper blinding and conscious or unconscious bias on the part of experimenters or subjects. After all, the subjects were chiropractors and were Carrick's students; perhaps they knew what to expect and wanted to please the teacher.

An example of how scientists can get erroneous results was Jacques Benveniste's study published in *Nature* in 1988.[3] It seemed to provide incontrovertible evidence that homeopathic dilutions left an imprint in water after all the molecules of the active ingredient had been diluted out. He had done a series of experiments that sounded infallible: his studies were double blinded, carefully controlled, and highly statistically significant. A team including the editor of *Nature* and James Randi later went to Benveniste's lab to observe his procedures. Under their watchful eyes, with proper precautions to prevent tampering and bias, the experimental results could not be replicated.

James Randi, through the James Randi Educational Foundation, has a standing offer of a million dollar prize to anyone who can demonstrate a paranormal phenomenon under carefully controlled conditions. On a BBC program in 2002, he challenged British researchers to repeat another homeopathy experiment on live TV; it had worked fine in their lab, but failed under the camera's scrutiny.[4]

I asked Randi if Carrick's experiment would qualify for the million dollars; he not only said yes, but he personally contacted Carrick to offer him a chance at the prize. I pointed out to Carrick that this was a great opportunity: all he had to do was to demonstrate his test under careful controls that he and Randi would agree to ahead of time. Randi even offered to be in another state while independent observers judged the testing. Carrick stood to gain not only a million dollars, but international renown. His research would be validated and he would be a hero. He would have proved that generations of medical scientists had missed easily demonstrated facts, and he would be the first chiropractor to present really good evidence that manipulation of the spine affects other parts of the body.

Carrick chose to consider the offer an insult and is no longer speaking to either of us. The local chiropractor who placed the newspaper ad was unconvinced by my arguments and is still using the test, because he believes the test helps him treat patients with various conditions including ADHD (attention deficit hyperactivity disorder), balance problems, learning disability, eye problems, and pain.

Chiropractic has been with us since 1895, when D.D. Palmer first adjusted a janitor's back and supposedly cured his deafness. Palmer said that all disease was due to subluxations (bones out of place), that subluxations interfered with the activity of the nerves that controlled all body functions, and that the body would be kept in perfect health by *Innate* if the spine was properly aligned. *Innate* (always capitalized) was his personification of the body's mystic ability to function properly without conscious guidance. He rejected the germ theory of disease.

As the twentieth century progressed, observers discovered that different chiropractors found subluxations in different places, and that you couldn't see any of them on x-rays. So chiropractic had to change its definition of subluxation from BOOP (bone out of place) to "a complex of functional and/or structural and/or pathological articular changes that compromise neural integrity and may influence organ system and general health."[5] If you find that definition vague and confusing, so do I. I *think* it means "subluxation is a good excuse for treating anything we want to treat with chiropractic adjustments."

They have never been able to convince medical science that these subluxations exist, that they impair nerve function, or that such impaired nerve function would lead to disease. Critical thinkers among chiropractors have given up the theory of subluxation and have elected to limit their practice to musculoskeletal conditions and evidence-based treatments. Other chiropractors still believe they can treat asthma, ear infections, colic, and a host of other "somatovisceral" problems by manipulating the spine. They would love to have objective proof that their adjustments have far-flung effects on the nervous system and on all the organs of the body. The blind spot test would have been just what they were looking for. Unfortunately, logic forbids.

The most fascinating aspect of my journey down the rabbit hole was the human psychology of those who live in Wonderland. I encountered direct refusal to accept logic. I could not get a Ph.D. scientist to admit that reproducibility did not equate with validity. I found a researcher who did not realize that any single experiment can reach an incorrect conclusion for a variety of reasons and that unexpected results must be always confirmed in another lab. I encountered a high tolerance for cognitive dissonance. In fact, you might say I encountered a different kind of "blind spot" in the human mind, one that allows clinging to a belief and ignoring the facts. It was an interesting trip, but I was ready to have Scotty beam me back up to where there was intelligent life. I reached for my SKEPTICAL INQUIRER and breathed a sigh of relief.

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Stupid Dino Tricks

A Visit to Kent Hovind's Dinosaur Adventure Land

Young-earth creationist Kent Hovind has built a dinosaur-filled theme park in the Florida panhandle and claims to prove that evolution is bunk. A visit there shows that it is definitely a fantasy land.

GREG MARTINEZ

Old Palafox Street is an aging, two-lane stretch of road running through the middle of Pensacola, Florida. To the east of Old Palafox, the next major road is Interstate 110 and in between those thoroughfares rests the sprawling campus of Pensacola Christian Academy, quickly followed by the even more sprawling campus of Pensacola Christian College. Both campuses are crammed with spotlessly maintained buildings and grounds. They stand out starkly amid the visible economic decline that surrounds them. The area is littered with empty, boarded-up buildings and abandoned strip malls.

Less than a mile north of the Academy on Old Palafox is a Christian educational center aimed at an even younger set

of pupils. Bracketed by auto-repair businesses and across the street from a pawn shop, Dinosaur Adventure Land beckons all comers with a billboard-sized street sign that includes a fierce cartoon dinosaur and announces, "Evolution: What a Dumb Idea!" The park's slogan is: "Where dinosaurs and the Bible meet!" Built in 2001 by Kent Hovind, a former public-school science teacher and founder of his own ministry, Creation Science Evangelism, the park boasts having hosted over 38,000 guests (Goodnough 2004). (This number may seem small compared to attendance rates at other Florida theme parks like Walt Disney World and Universal Studios, but it is also small in actual numbers. This averages out to approximately two hundred and forty guests a week, or less than fifty a day.)

The building of this rather small park has created a "tempest in a teapot" kind of controversy with local government. Essentially, Hovind converted the backyard of his home at 29 Cummings Road into a theme park, improvising an entrance off Palafox and refusing to file the proper zoning-permit requests with Escambia County. Hovind was charged on September 13, 2002, for failure to observe county zoning regulations, but through many legal maneuvers (multiple requests to have judges recuse themselves, switching lawyers and eventually requesting a public defender, and various stays requested, once for failing to appear), the case is approaching its two-year anniversary in the court system with no conclusion imminent. The charge is a second-degree misdemeanor resulting from refusing to pay a $50 permitting fee.

CIRCLE-SWIVEL
How to Play
Sit in the blue seat and hang on tight! Once the ride is over walk over to the blue pole and hold onto it. Believe it or not, it is not moving!
Spiritual Lesson
Sometimes life can get confusing, and we need something solid to hold onto. God's Word and promises are solid, and you can trust them. Keep your feet on Christ the solid rock.
SPRINGASAURUS

This is not Hovind's only scrape with the law (a visit to the Escambia County Clerk of the Courts Web site shows over a dozen court cases involving Hovind and his family). A month before the misdemeanor charge, Hovind was charged with felony assault, battery, and burglary with assault or battery. Charges were dropped in December 2002 when the victim, a member of Hovind's congregation, withdrew the complaint. (A lengthy description of the incident and an e-mail tit-for-tat between Hovind and his accuser can be found at www.geocities.com/kenthovind.) More significantly, the Internal Revenue Service raided Hovind's home and office in April 2004, confiscating financial documents related to the ministry and the park since January 1997. The IRS is charging that Hovind is evading taxes on more than $1 million in annual income and does not have a business license nor tax-exempt status for his ministry and the park (Norman 2004).

Dinosaur Adventure Land (DAL) and Hovind's home and ministry compound reside on approximately two acres. The entrance to DAL is off a road dominated by industrial parks, car dealerships, closed businesses, and convenience stores. The rear entrance, which leads to Hovind's home and the buildings for his Creation Science Evangelism (CSE) ministry, are off a pleasant and quiet residential road lined with modest single-family homes. One could walk from the entrance of the park (with a gate that very much recalls the memorable entrance in the film *Jurassic Park*) to the entrance of Hovind's ministry in about thirty seconds. The effect really is like being in someone's big backyard, stuffed full of children's games and playground equipment . . . and lots of fiberglass dinosaurs. (A pamphlet in the bookstore explains that the park is available for children's birthday parties.)

It is notable that the "Suggested Donation $7.00" mentioned on the ground-level entrance sign becomes a required admission fee by the time one enters the attraction. The park is centralized around the three-story main building that houses the admission office/bookstore, "Hands-on Science Center," and park offices.

The bookstore is small but has a wide-ranging selection of books, videos, DVDs, fossil replicas, hats, T-shirts, toys, cold drinks, photographic film, and so forth. The book selection reveals a broad array of concerns for Hovind aside from creationism. Unsurprisingly, there are titles addressing how to fight the teaching of evolution in public schools, but there are also some that describe how to fight the coming New World Order. Beyond conspiracies, Hovind also seeks to inform visitors about cryptozoology (books about sea and lake monsters—more about that later), home schooling, the risks of immunization, and a government-suppressed cure for cancer (Laetril).

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Touring Pseudoscience

Practically from the moment you enter the park, you are surrounded by tour guides. They are all male, appear to be in their twenties, and all wear the same yellow, oxford, button-down shirts with the DAL logo embossed above the breast pocket. They are omnipresent and suffocatingly attentive. They are the most important part of the park, because they are the ones who carry out its true mission. They keep up a breathless stream of patter and proselytizing, declaring almost everything in the environs an example of God's love and power.

The guides sweep the crowd of children and their adult escorts to the first part of the tour, called "The Expedition." It is a collection of playground equipment and learning-center activities dressed up with dinosaur-related names and the occasional dino head or tail. There is a sign next to each activity that explains what to do, the science it purports to illustrate, and the spiritual lesson that one should really take away from the experience. There is a simple lever-and-pulley device that a child can sit in and pull himself up and down on very easily. It is called the "Longneck Liftasaurus," and after the guides demonstrate the device with a child volunteer, they tell their audience that while the block-and-tackle device can give one a physical lift—that's the science lesson—it is only God that can give one a spiritual lift—that's the spiritual lesson.

Then it is on to the "Circle Swivel Springasaurus," in which a child volunteer is spun around a clearing on a swiveling harness that is suspended under the spreading branches of a huge, live oak tree. The child is instructed in how to hold his legs and arms to control his balance and change the shape of the arc. The science lesson includes some vague statements about centrifugal forces and conservation of energy, but the real point is that a life without God can leave you dizzy and confused and only God's guidance can show you the way. This is recited while the child stumbles around and nearly falls, indeed dizzy and confused after his Springasaurus experience, eliciting laughter from the crowd. The guides get a bigger laugh when they advise him that if he feels like he's going to "puke," he "should puke in the bushes and not on any of the rides." This, like almost everything said by the tour guides, is scripted. There is a television in the bookstore running a copy of the videotaped tour of the park hosted by Hovind, and his narration, even down to the "puke" joke, is repeated by the guides.

And on and on it goes. A visit to a common trampoline equipped with a low basketball hoop is next. The object is to bounce but stay in enough control to focus on getting the ball through the hoop. God, the guide intones, requires your total concentration; you need to focus on Him too. A climbing wall gets the same tiresome treatment. The guides get to rest their voices when they declare twenty minutes of free play for the kids.

Two single-user restrooms form a border to "The Expedition," and they provide what may be the most humorous item in the park. Bolted to the wall in both the boys and girls rooms are chains with tracts by the cartoonist/evangelist Jack Chick hanging from them. The pages are laminated and set on rings for ease of reading while using the toilet.

Eventually, the guides gather up the visitors and direct them to the "Raptor Range" on the other side of the park. This section follows the same pattern as "The Expedition," but with less control by the guides. The area is dominated by the "Dinosaur Frisbee Golf" course and the "Super Sound Satellite" (two concave disks that send echoes back and forth across the park that can only be heard by standing and speaking in a particular spot). The game with the longest line is the "Dinosaur Hunt," which is two large, rubber slingshots mounted in a wooden frame. Participants are given three water balloons apiece to launch at a metal-sculpture T. rex and stegosaurus.

During the free-play session earlier, five of the guides went to that game and began filling a large bucket with water balloons in preparation for the next stage of the tour. I wandered past taking photographs and eavesdropped on their conversation for a few moments. One would expect that men of that age would be talking about girls, sports, or even politics, but they were animatedly discussing a particular bit of scripture and how Presbyterians were particularly misguided in their interpretation. There was much gentle tsk-tsking when a balloon got loose from a fill-valve and sprayed the khakis of two of the guides.

Second in popularity to the water-balloon attack is the "Flingasaurus," a four-seat swing like one would find at a carnival. It is painted with black and yellow striping and spots on a green background. There is also a teeter-totter with a cross-

beam that is cut and painted to resemble a row of large teeth. The science lessons are quite a bit thinner here than on "The Expedition," but the spiritual lessons are always there.

The "Science" Center

The crowd is eventually pushed along to visit the "Science Center." Happily, it is air-conditioned and parents are slow to leave when the next stage of the tour is announced. The center is probably the cleverest in its seduction of the park visitors. Spread over three stories are demonstrations of actual science (gyroscopes, the Bernoulli effect, magnets, etc.) resting side by side with displays of pseudoscience, parapsychology, religious cant, and quackery. Each display is written in the same authoritative voice, but the voice is deceptive. Factually accurate sentences are mixed in with sentences that are patently false, producing a farrago of argument that only the most careful of readers will be able to parse.

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That River Didn't Make That Canyon!!!
Biblical answer to the Grand Canyon
Side Two
After the flood, lakes too full from rainfall would run over at the lowest point of elevation and carve features like the Grand Canyon in a few weeks.

A perfect example of this stands directly to the right of the entrance door. A sandwich sign rests above a long trough filled with sand, and a water spigot rests above the sand. Visitors are encouraged to make their own miniature Grand Canyon the way it was *really* made: by the Noachian Flood. The signs mock any other ideas of the canyon's formation.

Another installation purports to address Haeckel's Law (biogenetic law, or "ontogeny recapitulates phylogeny"), but only muddies and confuses an already complex debate. The many reasonable criticisms of Haeckel's research and theorizing are blown out of proportion until they are distorted. One would believe that Haeckel's theory was still an important part of biological research. This sign is the most intemperate of only a few that actually become active in their criticism. Most exhibits are gentle and nonconfrontational in their tone, which is what would be expected of instruction aimed at children. One seeking fire and brimstone would have to look elsewhere.

The middle of the bottom floor of the center is a sandpit with toy shovels and pails so that younger children can dig up fossil replicas. The pit is surrounded on three sides by glass cases at waist height that include fossil replicas and signs with scurrilous information denigrating geology, chemistry, and evolution. Particularly notable are the two models in the case directly next to the entrance of the "Fossil Dig." One dramatizes a scene from the Old English epic poem *Beowulf* (an inexpensive Dover Books edition of the poem is for sale in the bookstore.) The plaque explains that this is one of many examples of dinosaurs living contemporaneously with humans; apparently, *Beowulf* is a historical documentary and not just a legend. Next to that is a model of a sinking ship with survivors floating in the clear acrylic waves being caused by what appears to be an Ichthyosaurus. The plaque accompanying this model provides a quote from a survivor of a torpedoed English warship, which describes the sea monster he sighted during the chaos. This is only the first example of what will be a much more richly addressed topic in the "Creation Museum": dinosaurs did not become extinct in an ice age but are the sea and lake monsters that are known as Nessie, Ogopogo, Champ, and so on.

A staircase to the second floor runs along the back of the "Fossil Dig." The staircase is decorated with an installation that has more than three dozen different kinds of scissors attached to it and declares itself to be "The Phylogenetic Tree: Scissor Evolution?" The second floor is much smaller and contains a few computers and television/VCR combos to peruse the CD-ROM and video library offered there. Small posters illustrating

various aspects of evolution and geology decorate the walls of the second floor. They are printed with what appears to be a red-ink stamp that declares each of these tenets of scientific research a "Lie." In the midst of these posters, Haeckel is invoked again and a small flame of outrage jets up briefly. The text on one poster insists that embryos never grow gills and that abortions are killing human beings, not fish. There is also a detailed model of Noah's Ark.

The third floor is considerably smaller than the two other floors and is a recreation room with a television, board games, and an air-hockey table. The table is scattered with pamphlets for the park, Bibles, and many copies of Chick cartoon tracts that rail against evolution.

The tour moves on to the "Creation Museum," which directly adjoins the main building and has a fiberglass T. rex dramatically bursting through the wall above the museum's entry door. The first room of the museum greets you with a large heirloom Bible opened to Genesis. The room also houses a collection of several small animals (a Madagascar hissing cockroach, a ruby tarantula, chinchillas, etc.) whose complexities are alleged to be sterling examples of deficiencies in evolution that serve to disprove Darwin's science and demonstrate the superiority of creation science.

The next room is a small theatre where one can watch a videocassette that explains Hovind's grand vision of biblical creation, a young earth, and so forth. Directly above the large-screen television is a sign that says: "Reality! Evolution is a religion." The back of the theater consists of two large, glass display cases, one that addresses the many ways in which the Noachian Flood created the modern world and the other devoted to explaining that dragons are not mythology but instead accurate reports of dinosaurs living among humans.

The third and final room of the museum is a collection of fossils, including a plaster cast (under glass with muted lights, as if it was truly a fragile antiquity and not a painted plaster casting) that purports to be from a thirteen-foot-tall human giant that was unearthed in California in 1883. This, coupled with other anecdotes and photos of other modern-age giants (Robert Wadlow, et al.), leads to an assertion that biblical accounts of giants were indeed factual. The room also contains a collection of replica fossils both real and fraudulent (including replicas of the Ica Stones and Paluxy dinosaur/man tracks). The room resembles a cramped version of a Ripley's Believe It Or Not museum.

Dinosaurs and Deception

Dinosaur Adventure Land is deceptive on many levels. It is obviously wrong about its claims of a scientific explanation of the origins of life on Earth based on the Book of Genesis. But it is also deceptive in its manner and methods. Much of the park contains little more than playground equipment, exhibits, and activities one would find at a real science education center for children. These rather commonplace activities are dressed up in a dinosaur drag that has no real point except to act as a come-on, a lure to children and families that might otherwise stray away. A plain creationist museum would serve to attract only the already converted, acting as an echo chamber so that they might have their ideas repeated back to them. To attach a bunch of silly dinosaur names to playground equipment and stick fiberglass dinosaur parts here and there is the beginning of an effective marketing ploy. The realization that there really isn't anything much dinosaur about it comes only after you have paid your admission and been subjected to a lengthy bath of proselytizing.

The proselytizing is very carefully scripted. Such a script is necessary because the connections between the games and activities and biblical doctrine are virtually nonexistent. The lesson signs are usually too high for any but the tallest of children to read, and the kids probably wouldn't read them anyway. The guides are always there, always polite and always present, repeating the message. The message needs to be emphasized in this way because the items in the science center and museum are so scattered and diffuse that they never really add up to an effective argument. Here you will find some confounding assertions about granite and polonium halos; there a sign calls Darwin a liar. Here's a display telling you that sea monsters are real; there a beach ball floats on a shaft of air generated by a fan. Curatorially speaking, the place is a disaster.

To attach a bunch of silly dinosaur names to playground equipment and stick fiberglass dinosaur parts here and there is the beginning of an effective marketing ploy.

Dinosaur Adventure Land is just a playground tricked out with dinosaur dressage to attract an audience that can then be enticed, seduced, and eventually duped into accepting superstitions, pseudoscience, and plain nonsense passed off with a patina of both scientific and religious authority.

Acknowledgement

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Explaining the Plagues of Egypt

The Ten Plagues of Egypt, as told in the Book of Exodus, can be easily explained. Or maybe not. . . .

JEFFREY A. LEE

Much of this article is about the plagues of Egypt, as presented in the Old Testament's Book of Exodus. But this is not a discussion of plagues or of religion; instead it is about scholarship and how it is done when there is a dearth of evidence on a particular topic. Many scholars believe that there is a historical basis for Bible stories and that it is valuable to use the methods of scholarship to shed light on the events these stories describe. The plagues of Egypt serve as one example. This piece is not a thorough review of research on the plagues; I have merely chosen three examples of scholarly research by scientists to illustrate how scholars sometimes hang their conclusions on rather flimsy evidence—and that readers should take this into account as they evaluate scholarly arguments.

Epidemiology

There are straightforward explanations of the ten plagues. Most are epidemiological in origin. H.M. Duncan Hoyte (1993) and John S. Marr and Curtis D. Malloy (1996) approach the plagues from a medical point of view, and they do not always come to the same conclusions. According to Hoyte, the water of the Nile turned red because of a "red tide" of dinoflagellates, which is common in salt water, but does occur in fresh water as well. Red tides can be toxic to fish, leading to massive fish kills. In the Nile, the water would have turned red, the fish would then have died, followed by the stench of their carcasses. Frogs would have fled the river, invading the surrounding lands and then died of dehydration. Marr and Malloy also suggest that a dinoflagellate bloom is the cause of color change and the fish kill. The reason for the population explosion of frogs following the fish kill is not clear in their paper (they may have felt that reduced predation by fish was the obvious explanation).

The "lice" of the third plague is sometimes translated as "gnats" and may in fact have been mosquitoes, according to Hoyte. The species is most likely *Culex antennatus*. Marr and Malloy conclude that nearly microscopic and bloodsucking midges better fit the description of the third plague, particularly *Culicoides* species.

The flies that constitute the fourth plague are most likely stable flies (*Stomoxys calcitrans*), according to Hoyte. Marr and Malloy agree that this species is the most likely culprit.

The fifth plague involves a *murrain*, a plague, that killed many farm animals. Hoyte concluded that *surra*, a disease that affects most farm animals but not humans, is the cause. Stable flies transmit *surra*, so plague number four could have led to plague number five. Marr and Malloy conclude that plague three led to plague five, that the *Culicoides* midge transmitted both African horse sickness (killing horses, donkeys and other equines) and bluetongue (killing cattle, sheep and goats).

The boils and skin sores of the sixth plague, according to Hoyte, resulted from the bites of stable flies. Open wounds led to infections such as Group A streptococci. Marr and Malloy conclude that it most likely was glanders, an airborne bacterial disease of animal and humans presently found in Africa and the Middle East. Fly bites can transmit glanders.

Hoyte simply states that the seventh, eighth, and ninth plagues were a hail storm, a swarm of locusts, and a dust storm respectively. Marr and Malloy point out that hailstorms do occur in Egypt and can devastate crops. A plague of locusts would have devoured all plant food still in the fields. The plague of darkness is a dust storm, a common event in the region.

The final plague, death of all firstborn, is most likely caused by an epidemic of typhoid fever, according to Hoyte. Marr and Malloy disagree with the typhoid idea and offer another explanation. They conclude that the loss of fish, crops, and livestock meant that the only food source left was the stored grains from previous harvests. Toxic substances produced by fungi in the grains could have killed those who ingested them and in a time of shortage, the firstborn would have preferential access to the stored food.

Volcanology

There are straightforward explanations of the ten plagues. Most are related to a volcanic eruption.

Dorothy Vitaliano (1973) takes a geological interpretation of the ten plagues. Most can be tied to the fifteenth century B.C. eruption of Santorini Volcano, in the Aegean Sea. This large eruption is implicated in the destruction of the Minoan civilization on Crete and, as much of Santorini sank below sea level after the eruption, the legend of Atlantis may have a connection to this event. In addition, Vitaliano explains, the eruption's effects would have been felt further downwind, in Egypt. Volcanic eruptions are known to produce unusual weather conditions and this plays a prominent role in Vitaliano's explanation of the plagues.

Many people fail to make the distinction between *possible* and *probable*, between "could have" and "did" in past events, and between "might" versus "will" in future events.

Vitaliano is not sure what caused the waters to turn red. Previous scholars have suggested that some of the ash from the volcano would have been pink and would have washed into the river, thereby tinting the water. Vitaliano thinks that this is unlikely to have been confused with blood and a more reasonable explanation is an algal bloom, which can be red in color. There is a possibility that the algal bloom was connected somehow to the strange weather conditions following the eruption, but she does not speculate about exactly how. With the first plague, Vitaliano is in general agreement with Hoyte and with Marr and Malloy.

The plague of frogs may be attributed to the weather, as well. Some species of desert frogs lay dormant in the soil until sufficient water is available for them to become active and reproduce. They then go dormant again as the land dries out. Heavy rains caused by the eruption could have brought about a massive outpouring of frogs. The third and

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fourth plagues, lice and flies, can also be explained by unusually wet conditions, conducive to insect reproduction. As a geologist, Vitaliano made no attempt to identify the species involved.

The fifth plague, the death of livestock, may be directly caused by the ash fall. Hekla, a volcano in Iceland, erupted in 1947 and again in 1970. Both times, sheep that ate grass covered in fine ash particles died of fluorine poisoning. By analogy, toxic ash may have killed the Egyptian livestock as well. How the Israelite's livestock survived is not clear, unless they, for some reason, prevented their animals from grazing until the ash had washed off the vegetation. Toxic ash may be responsible also for the skin problems, the sixth plague.

Moving on to the seventh plague, hail, and lightning are often associated with volcanic eruptions. Tiny ash particles can serve as condensation nuclei for hail, and strong electrical charges are common in the ash-filled air.

The plague of locusts may be simply a coincidence, according to Vitaliano. Locust swarms are not unusual in the region and she found no direct connection to the eruption.

Plague number nine—darkness for three days—is easily explained by the ash blotting out the sun. Santorini produced tremendous amounts of ash.

The final plague, death of the firstborn, can be partially explained. Widespread death is a likely aftermath of the insect invasions and crop destruction by hail. Why the firstborn in each family died is not clear.

Discussion

Vitaliano does make clear that most of her explanation is speculative. She is confident that the ash of Santorini is the explanation for the plague of darkness. In her words (p. 259), "indeed, it is difficult to explain it in any way other than the effects of an ash cloud." The other explanations are only possibilities.

Hoyte, however, writes with more assurance in his conclusions. He begins his final paragraph with "In summary, the series of disasters was . . ." followed by a listing of his conclusions. Marr and Malloy do make clear that they are presenting their interpretations of the plagues, "using Occam's razor as needed to reduce discordant explanations to the simplest and most logical." I will speculate that Hoyte disagrees that Marr and Malloy's conclusions are the most logical.

Yet there is no empirical evidence of what happened in Egypt at the time in question, beyond a few passages in the Bible and some Egyptian records that may or may not be related. The scholars I quoted above are presenting logical possibilities, but there is a big difference between *possibilities* and *probabilities*. Many people fail to make the distinction between possible and probable, between "could have" and "did" in past events, and between "might" versus "will" in future events. We can see this, for example, in government economic and social policies, archaeology, and education planning. I like to believe that most scholars understand the difference, even if they do not explicitly say so in their writings, but many in the public do not make the distinction.

A second point is that these writers are doing what scholars are supposed to do in attempting to explain the Egyptian plagues. They used their expertise to find what they feel are the best explanations of a particular problem and then presented them to the scholarly community. It is the job of others with relevant expertise to look for flaws in their arguments and present alternative explanations. Scholarship is more about what the community agrees to than about what one person thinks. That there is so little consensus of opinion on the causes of the plagues shows that none of us should be confident in *any* explanation. Unfortunately, "We just don't know" is hard for many people—especially experts—to say.

My final point is about thinking critically. I am a geographer, with some background in geology. Many years ago I read Vitaliano's book and accepted her explanation readily, knowing that it was speculative, but it made sense to me. I now know that I was willing to accept it because I liked the idea that volcanoes have a major effect on civilizations; it made what I do feel more important. When, several years ago, I saw a television program outlining Marr and Malloy's explanations, my first instinct was to reject what they said because it was fundamentally different from what I had previously accepted. This is an example of lousy critical thinking in a couple ways. I accepted a theory because it made me feel good, not because it was sound and I rejected another theory because it went against my previous learning, not because it was unsound. I like to think that my thinking has matured after recognizing my mistakes.

So what caused the plagues of Egypt? We just don't know.

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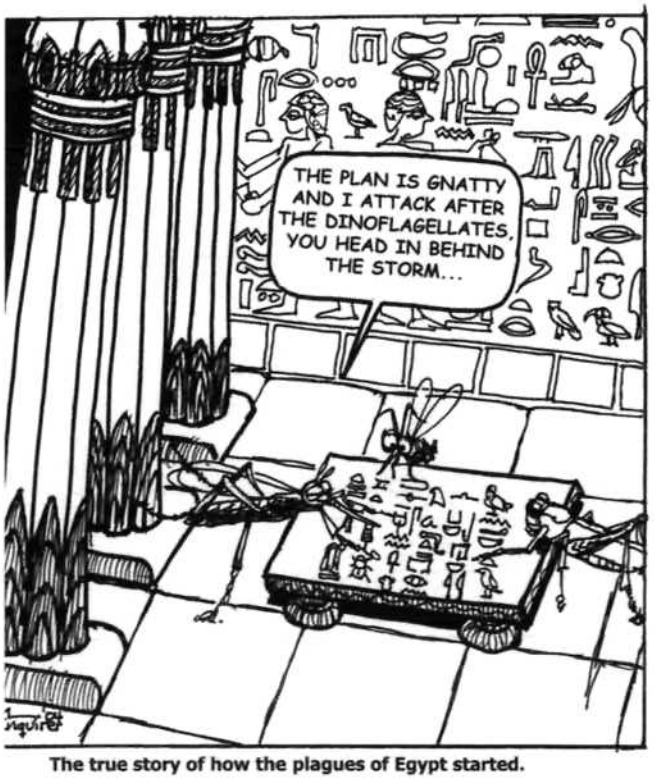


The true story of how the plagues of Egypt started.

Discovering Human Interconnection Through the History of Our Genes

MARK W. DURM

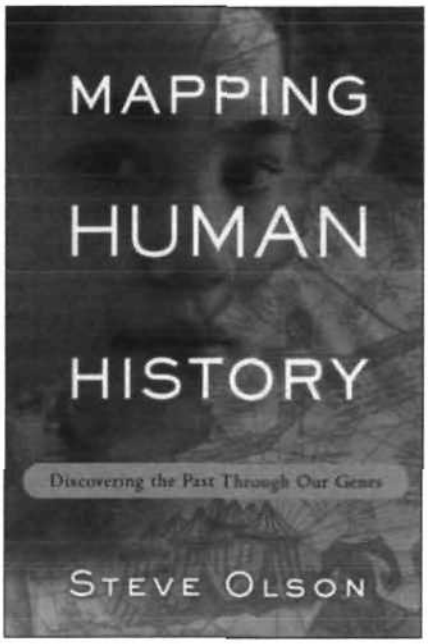
Mapping Human History: Discovering the Past Through Our Genes. By Steve Olson. Houghton Mifflin, New York. 2002, ISBN 0-618-09157-2. 292 pp. Hardcover, $25.

Everyone in the world today is most likely descended from Nefertiti (through the six daughters she had with Akhenaton), from Confucius (through the son and daughter he is said to have had), and from Julius Caesar (through his illegitimate children, not through Julia, who died in childbirth). One need go back only a couple of millennia to connect everyone alive today to a common pool of ancestors.

The above is just one of many intriguing revelations the reader will find in Steve Olson's book *Mapping Human History.* Olson has worked for the National Academy of Sciences, the White House Office of Science and Technology Policy, and the Institute for Genomic Research. He is a proponent of the single-origin theory of modern human evolution. This theory holds that modern *Homo sapiens* is a new species that arose more than 100,000 years ago in Africa and moved across the globe replacing indigenous archaic populations.

Olson carefully and authoritatively sheds strong skepticism on the concepts of *race* and *ethnic grouping.* He believes that human groups are much too closely related genetically to differ in but the most superficial way. In other words, we are all cousins and are descended from Nefertiti, Confucius, and Julius Caesar.

A key to this skepticism concerning race is what we know about DNA and mitochondria. Mitochondria are "hitchhikers," so to speak, inside every human cell. They are almost certainly descended from bacteria that began to live inside the cells more than a billion years ago. They are the cellular battery pack



providing the cell with energy. The cell, in turn, provides them with a comfortable place to live.

But all humans receive their mitochondria from their mothers. Sperm cells do have a few mitochondria, but "they are tossed away like worn-out flowers in the process of fertilization." Since mitochondria are transmitted from the mother, Olson writes that all "human mitochondrial DNA sequences that exist in the world today are descended from the mitochondrial DNA of a single woman." A mitochondrial Eve, if you please.

Olson relates his initial skepticism when he also first heard of this "Eve." He pondered how all six billion people on Earth could have descended from a single woman. Yet, now, he writes, "this is one of those wonderful scientific conclusions that is not only true but *has* to be true." He then proffers both mathematic and genetic explanations for Eve. Mitochondrial Eve was not the only woman alive during her time, by the way; it is just that her line survived.

Olson also writes there was an Adam and all men are his descendants. But again, this man was not the only man alive during his time and he probably did not know Eve.

If our mitochondria come from this Eve and all Y chromosomes come from the Adam, does all of our DNA? No, writes Olson. All human DNA comes from approximately 86,000 people who once lived on Earth. If this is so, then why is everyone's DNA not the same? That question, writes Olson, is the single most important question in all of human biology. The question evokes issues of how different appearances of human groups occurred, why genetic diseases happen, and what role our genetic heritage plays in determining who we are.

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The answer is mutation. Olson describes the different types of mutation and how mutation could have caused one of Eve's daughters to produce a different mitochondrial sequence. A distinct mitochondrial sequence is called a *haplotype*, and a group of related haplotypes that descend from a single ancestral haplotype is termed a *haplogroup*.

The majority of *Mapping Human History* is centered around investigating and studying these haplogroups. Olson starts in Africa and discusses very early man and his migration outward. Next he travels to the Middle East and discusses Aaron, Moses's brother. Aaron's male lineage was decreed by the Jewish God to become the high priest, the *Kohanim*, of the Israelites. Surnames of Cohen, Cohn, and Kahn are derivatives of *Kohan*. A few years ago geneticists found about 50 percent of Jews who presently identify themselves as Kohanim as having a set of particular genetic markers. Today this is called the Cohen Modal Haplotype. Thus Aaron may have been a real person.

Olson then sets his sail for Asia and Australia. He devotes a chapter to "Genes and Languages" and how they may have sprung from a common source. Europe is next on his itinerary, and he relates how every present-day European has some DNA from a Middle Eastern farmer and a Stone Age hunter-gatherer.

The Americas are next and Olson relates that not all of the Native American ancestors may have come from just the Bering Strait pass. Some may have come by boat.

Olson finishes his travels and his book with a stop in Hawaii. He describes how the Hawaiian "genetic history" is occurring backwards. In the single-origin theory, human groups become differentiated in appearance as they move across the globe and undergo some measure of reproductive isolation. In Hawaii, the reverse is happening. Physical distinctions that took thousands of generations to create are being undone with a few generations of intermarriage.

Finally, as I mentioned earlier, Olson is very skeptical about the concepts of *race* and *ethnic grouping*. His book is based in biology but has a social objective. He concludes:

> *Our DNA is too tightly interconnected to use biology to justify what are essentially social distinctions. Our preferences, character, and abilities are not determined by the biological history of our ancestors. They depend on our individual attributes, experiences, and choices. As this inescapable conclusion becomes more widely held, our genetic histories inevitably will become less and less important. When we look at another person, we won't think Asian, black, or white. We'll just think: person.*

Olson's book is a fascinating look at human genetic history.

Biblical Pseudoarchaeology by a Swedish Professor of Medicine

MARTIN RUNDKVIST

The Exodus Case: A Scientific Examination of the Exodus Story—And a Deep Look into the Red Sea. Lennart Möller. Translated into English by Margaret Bäckman. Forlaget Scandinavia, Copenhagen, 2002.
ISBN 87-7247-230-8. 315 pp. Hardcover, $34.95.

Lennart Möller specializes in the health hazards of air pollutants and the damage to DNA that they cause. Since 2001, he has been a professor of environmental medicine in the department of bioscience at Karolinska Institutet, one of Europe's largest medical universities and Sweden's main center for medical training and research. Beside his academic duties, Möller is an active member of Evangeliska Fosterlands-Stiftelsen, founded in 1856, a missionary organization within the Church of Sweden. He has edited and authored books on ethics and Gospel exegesis and recently a volume on biblical archaeology, *The Exodus Case*.

This book is the fruit of extensive travels in the Near East and Egypt. Its stated main purpose is to test a hypothesis: that the biblical texts of Genesis 11:27 through Exodus 40:38 are historically correct. A secondary purpose is to evaluate and expand upon the works of the late Ron Wyatt (1933–1999). Möller's book is presented with an explicitly scientific impetus. Möller wishes to subject his hypothesis to an unprejudiced test and encourages the reader to be critical but keep an open mind.

So far, so good, it may appear. But there are disturbing signs already in the book's introduction. First, it is naïve to judge these long texts, preserved through thousands of years of oral and written traditions, as either true or false in their entirety. Academic historians evaluate discrete factual statements, not entire books at one go. But Möller emphasizes that he is neither a theologian, a historian, nor an archaeologist. In fact, he underlines that he does not know what these disciplines believe regarding the questions he takes on. Möller feels that he can thereby offer a fresh perspective.

Then there are the references to Ron

Martin Rundkvist is an archaeologist specializing in the pre- and protohistory of Scandinavia. He is a member of the board of the Swedish skeptic organization, Vetenskap och Folkbildning, and co-editor of the association's quarterly, Folkvett. *He lives in the suburbs of Stockholm, Sweden, 400 meters from a Viking-period cemetery.*

Wyatt. If ever there was a true native of Däniken Land, it was Wyatt. His writings on biblical archaeology are such extreme flights of fancy that even many creationist debaters dismiss them as wild imaginings.

While ostensibly scientific, Möller's perspective is at the same time explicitly antirational (p. 15). We should not be too sure of ourselves and our powers of reasoning. Only God is perfect, says Möller, and humankind is frail and weak. Look at the *Titanic*, it sank even though it was supposed to be unsinkable! This is, put mildly, a weakness in Möller's "research strategy." Möller is a Christian and thus strongly biased toward the belief that the hypothesis that he sets out to test has been formulated by God himself.

Successful scientists believe in all statements until they have been disproved, according to Möller. Having offered this parody of Popper's criterion, he sets out on his biblical trek through time and space from Abraham in Ur to Moses on Mount Sinai. Soon it becomes clear that Möller is not in fact trying to disprove his hypothesis. Quite the contrary; he searches intensively for anything that fits with it. The idea that the selected texts are historically true is not a hypothesis for Möller, it is the basic axiom of his investigation. To the extent that he takes his pseudo-Popperian philosophy of science seriously at all, Möller appears to feel that the task of disproving the hypothesis is the reader's job, not his.

Möller's attitude toward established academic disciplines is cheerful and completely fearless. Where a less courageous author might have checked a few handbooks for current thinking on the issues at hand, Möller stomps in brandishing revealed truth and starts from zero. The book interfoliates a Bible summary with absolutely vertiginous speculations in archaeology, history, geology, and onomastics (the study of the origins and forms of words). Gomorrah was located on the plain between the hilltop stronghold of Masada and the Dead Sea. The reason that there is now only a gypsum formation to be seen there is that the wicked city was built of limestone and destroyed in a rain of burning sulphur: limestone + sulphur = gypsum! Joseph, son of Jacob, is identical with Imhotep, the architect of the Stepped Pyramid at Saqqara. This identification moves the Third Dynasty a thousand years forward in time from its accepted date. This does not appear to trouble Möller, as he feels that the dynastic chronology of Egypt contains serious uncertainties. Moses is identical with Pharaoh Tutmosis II, as indicated by, among other things, the fact that the Pharaoh is depicted with a hooked nose, suggesting a Hebrew heritage! And so on.

Wherever Möller goes, what he sees turns out to be relevant to his search. He finally finds Mount Sinai in the northwest of Saudi Arabia (across the Bay of Aqaba from the actual Sinai peninsula), where he gets into trouble with local authorities who thwart his truth-seeking ambitions and erect a fence around the rediscovered altar of Moses.

The Exodus Case is such an extreme example of pseudoscience that any reasonably well-informed reader will wonder if Möller is joking. Is the professor of medicine, a member of the extremely undogmatic (as these things go) Church of Sweden, making fun of the literalists? No, unfortunately not. He continues to market the book and its contents through talks, a videotape, and foreign translations. He is one of the signatories of "A Scientific Dissent from Darwinism," a document put out by the conservative Discovery Institute. And everywhere, he proudly touts his professorial rank and his affiliation with the prestigious Karolinska Institutet. It is sad indeed that a highly trained scientist in the prime of his years and in a position of great responsibility can have either such a complete lack of critical perspective or such a cavalier attitude toward science. □

STATEMENT OF OWNERSHIP, MANAGEMENT, AND CIRCULATION (Required by 39 U.S.C. 3685)

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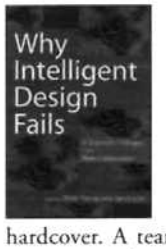
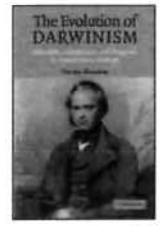
Listing does not preclude future review.

Panic Attacks: Media Manipulation and Mass Delusions. Robert E. Bartholomew and Hilary Evans. Sutton Publishing, London, 2004. 222 pp., hardcover. This entertaining history of the effects of news stories, media hype, and urban myths on the popular imagination is presented as a series of lively case studies. The examples range from the Great Moon Hoax of 1835 and the Halley's Comet scare of 1910 to the "Lost" Tasaday Tribe deception of the 1970s and 1980s and the modern American "witch hunt" that created a sex-abuse accusation epidemic from the late 1970s to early 1990s involving "repressed memories." Other examples include chemical and biological terrorism scares going back to 1630, the mad cow disease hysteria, media-driven social delusions involving real or imaginary creatures, and the Heaven's Gate mass suicides stimulated by a bizarre comet-spaceship theory.



Why Intelligent Design Fails: A Scientific Critique of the New Creationism. Edited by Matt Young and Taner Edis. Rutgers University Press, Piscataway, NJ 08854-8099, 2004. 240 pp., $39.95, hardcover. A team of physicists, biologists, computer scientists, mathematicians, and archaeologists takes proponents of "intelligent design" to task by examining its tenets from a scientific perspective. It makes the case against intelligent design from the perspective of many disciplines and also demonstrates ID's technical failures to readers who are not experts in those fields. Intended to be a standard reference for all seriously interested in the debate over intelligent design.

Evolution vs. Creationism: An Introduction. Eugenie Scott. Foreword by Niles Eldredge. Greenwood Publishing, P.O. Box 5007, Westport, CT 06881-5007, 2004. 272 pp. $49.95, hardcover. There are many books on the creationism/evolution controversy, but here Eugenie Scott, who as head of the National Center for Science Education is at the center of it all, looks at the controversy from historical, legal, education, political, scientific, and religious perspectives, something no other single book does. It's intended to provide the reader with a foundation in the ideas that have shaped the controversy, and it provides additional resources for those who need more detail. The book is written at a level that she hopes students will find useful in gaining perspective when attempting term papers and other assignments on the matter. She emphasizes that the uproar we hear about evolution is not a scientific controversy but it most definitely is a public controversy. Its foundation in history, science, religion, and politics that she presents should be of wide value.



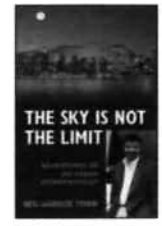
The Evolution of Darwinism: Selection, Adaptation, and Progress in Evolutionary Biology. Timothy Shanahan. Cambridge University Press, New York, 2004. 342 pp. $80, hardcover; $29, paper. A philosophy professor (Loyola Marymount) who agrees that no other scientific theory has had such an impact on our understanding of the world and ourselves here examines three profound issues about Darwin's theory of evolution by natural selection: selection, perfection, and direction. Part I focuses on natural selection, the central theoretical principle of Darwinism and considers at what levels Darwin and modern biologists think selection works. Part II examines the issues of biological "perfection." How did Darwin, and how do today's biologists, view the issue? What degree of perfection does natural selection predict? What prevents perfect adaptation? Part III examines the controversial issue of evolutionary progress. How did Darwin view it? How do today's biologists view it? Does it make sense to talk of "higher" and "lower" organisms? Or more "advanced" organisms? Is there an overall direction to evolution? Does it make sense to describe evolution as "progressive?" A final chapter considers all these issues with an eye toward understanding their significance for human evolution.

Truth, Knowledge, or Just Plain Bull: How to Tell the Difference. Bernard M. Patten. Prometheus Books, Amherst, New York, 2004. 344 pp., $20, softcover. Subtitled "A Handbook of Practical Logic & Clear Thinking," neurologist Patten helps you sort out the claims of experts, pseudo-experts, scam artists, and liars and protect yourself from nonsense and fraudulent claims. He examines investment frauds and other scams, groupthink, the psychology of belief, content analysis, and hidden meanings and gives rules of clear thinking, explains different kinds of logic, and exposes traditional fallacies.

Radiation and Modern Life. Alan E. Waltar, Ph.D. Introduction by Dr. Hélène Langevin-Joliot, granddaughter of Marie Curie. Prometheus Books, Amherst, New York, 2004. 311 pp., $28, hardcover. Many people today fear the word *radiation*, and despite our technological sophistication misconceptions and misunderstandings about radiation abound. This book is worthy attempt to correct the balance. Written by the Director of Nuclear Energy at Pacific Northwest National Laboratory (Nobel laureate Glenn T. Seaborg was to be the original author, but he died before the writing began), it briefly and clearly describes the immense contributions of radiation and radioactive sources to modern life. Chapters deal with agriculture, medicine, electricity, modern industry, transportation, space exploration, terrorism, crime, and public safety, arts and science, environmental protection, and the modern economy.

New in paperback:

Doubt: A History. Jennifer Michael Hecht. HarperSanFrancisco, 353 Sacramento St., Suite 500, San Francisco, CA 94111, 2004. 576 pp. $16.95, softcover. First trade paperback edition of this ambitious "History of the Great Doubters and Their Legacy of Innovation from Socrates and Jesus to Thomas Jefferson and Emily Dickinson." (Listed in New Books, January/February 2004.)

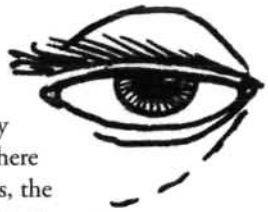


The Sky Is Not the Limit: Adventures of an Urban Astrophysicist. Neil deGrasse Tyson. Prometheus Books, Amherst, New York, 2004, 203 pp. $18, paper. First trade paperback edition of this story of the author's (Director of the Hayden Planetarium and "Universe" columnist for *Natural History*) fascination with the night sky and scientific curiosity that led him to astrophysics. Tyson provides a new preface and other additions. (Listed in New Books, September/October 2000.)

—Kendrick Frazier

My Wife—and the Dialectics of External Historicity

RALPH ESTLING



FACTUAL TRUTH

FICTIONAL TRUTH

Let me say right off the bat that I very rarely argue with my wife. There are a number of reasons for this, the most excellent being that we almost invariably see eye-to-eye on everything. On those rare, virtually nonexistent occasions when our eyes don't quite match up 100 percent, I am more than happy to admit openly and freely, and I can't help a certain upwelling of manly self-esteem at the thought of my decency, objectivity, and forbearance, that, for a woman, she shows a remarkable and praiseworthy attempt to deal with the nature of logic and coherence as fully as one could hope. It is when I point this out to her in our conversations that I often sense a need to retire to the kitchen to make her a cup of tea.

I am writing this soon after we viewed the film *Sands of Iwo Jima* on the telly. If you fail to grasp the connection between this fact and the previous paragraph, I should explain, first, that in this old movie, in which John Wayne defeats the Japanese army, there is a scene showing the famous raising of the American flag on the summit of Mount Suribachi by U.S. Marines, filmed by a war photographer whose name I have forgotten, and later immortalized in a statue in Arlington, Virginia; and second, as I think is generally known, the photo does not show quite what it appears to show.

Our frequent columnist Ralph Estling writes from Ilminster, Somerset, England.

As I quietly explained to my wife, the flag had been waving there some while before the cameraman had arrived on the scene, so the original flag raising had not been filmed. The cameraman then prevailed upon a group of other Marines standing nearby to take down the flag and its pole and then raise them all over again, this time for the camera, which was duly done, though by different Marines than those who had done it originally, when there was no cameraman to record the ceremony. I went on to explain *to my wife that, to my mind, this fact* slightly vitiates the meaning of the whole thing. My wife maintains that it does not, that the photo was inspirational, whether or not the actual flag-raising was taking place for the first or second time, as a spontaneous gesture or at the request of the late-arriving war photographer.

This caused me to mention that the almost equally inspirational filming of General Douglas MacArthur coming ashore on Leyte Island in the Philippines and announcing, "I have returned!" was shot three or four times before the cameramen got it right, in General MacArthur's carefully considered judgment.

This, in turn, caused me to reflect on three wonderful films made by the great Soviet director Sergei Eisenstein, surely one of the greatest filmmakers: *Battleship Potemkin*, *October*, and *Alexander Nevsky*, absolute classics of the cinema, beautifully produced, exquisitely crafted, breathtakingly filmed, and almost total fabrications, by which I mean, lies.

Who can forget the scene where the rightly mutinous sailors have a large tarpaulin thrown over them while they await the fiendish order from the smirking, moustachioed captain to the firing squad to shoot them down! Which of you, capitalist to the core, does not feel his heart beat faster as, at Petrograd's Finland Station, while searchlights play over the upturned faces, young or grizzled, of the staunch, gaunt revolutionaries, Lenin addresses the assembled soldiers, workers, and peasants, followed by the indescribably thrilling storming of the Winter Palace!

None of this ever happened.

I mean, Eisenstein made magnificent *movies* in which all this happened, but it never happened like this in real life. All the scenes I've just described are the creations, vivid enough, of Sergei Eisenstein. They are, so far as actual history is concerned, complete and utter crap. True, Alexander Nevsky did defeat the Teutonic Knights at the Battle on the Ice, saving Novgorod and becoming a great hero in the eyes of Russia, but Eisenstein (and Stalin) failed to make clear that Nevsky was and remained throughout his life a vassal of the bloody,

all-conquering Mongols, not a fearless, independent defender of the freedom of the Russian people against the invader.

So the question arises, comrades and John Wayne fans: What is truth? And the next question pounces on us before we even have time to answer the first: Should we permit ourselves to be inspired by things we *know* to be gross distortions of the true events, the ones that *really* occurred, these distortions being vernacularly known as lies?

I'm not just talking about photography, stills or moving pictures. I'm asking, *is there such a thing as artistic truth or spiritual* truth or *emotional, inspirational* truth that differs in every important detail and particular from—what can I call it?—*real* truth and is in some mystic, overarching way *more* true, *more* real than what truly took place? Did Galileo *really* drop balls from the Leaning Tower of Pisa and did he *really* murmur, "Nevertheless it moves" as he was escorted out from the chamber of the Inquisition? No. Does it matter? Yes. Why? Because truth matters, whether it is artistic or not. Whether it is the poetic license of a John Wayne or a Sergei Eisenstein. Whether it is happening or has happened on Iwo Jima or in Petrograd or Rome or on a star in a galaxy at the far end of the universe. Truth matters. The actual, as opposed to the fictional—the revisionist—matters.

Lies matter too. Truth, reality, the actual, exist outside us, but lies can only exist within us. I think this distinction in locality is important, though I cannot say why exactly. I think it must have *something to do with the objective, outside-us* nature of truth and the subjective, inner condition of untruth.

Still, how much does it matter if we embroider just a little? Is it really so terrible? After all, it *is* a fact that *some* Marines *did* raise the flag on Mount Suribachi. MacArthur *did*, after all, splash onto the beach at Leyte. The Russian revolutions of 1905 and 1917 really *did* take place! So, does it really matter, all *that* much, that one of the greatest scenes in cinematographic history—the Czarist soldiers marching in perfect cadence down the never-ending Odessa Steps, firing in perfect order as they descend, the old woman with the broken eyeglasses, the screaming baby in its carriage bouncing ever downwards—sprang from the brilliant imagination of one of the cinema's greatest directors? Isn't it *artistically* true? Doesn't inspirational genius mean something more than mere, common fact! What is wrong if we revise truth ever so slightly?

When Art transforms itself into propaganda and propaganda transmutes *into lies, somewhere, there is a line to be* drawn. Truth matters more than men, even geniuses, more than Art, Science, Spirit, Inspiration, Comfort, Hope, and Fear. Truth matters more than anything we create, no matter how wonderful, and it is a great crime to pretend otherwise, whether to others or to ourselves alone, whether massively or just a tiny smidgen.

Okay. I've made my point. So I think I'll stop and go out into the kitchen and make my wife a nice cup of tea. □

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Capital Punishment and Homicide: Two Kinds of Statistical Studies

Ted Goertzel's cover article "Capital Punishment and Homicide: Sociological Realities and Econometric Illusions" stimulated a voluminous reader reaction. Here is a sampling of the reader commentary.

"Capital Punishment and Homicide" by Ted Goertzel (July/August 2004) is a fine study of theoretical statistics. But it leaves out three realities: justice, murders by murderers released from prison, and murders in prison. He has no statistics on these realities. The elephant in the room is ignored.

Nemesis, the Greek goddess of retributive justice, must be sad over the ignorance and stupidity of American law and juries that let off murderers with short sentences or none at all. Even longer sentences of twenty or thirty years are often commuted and the murderer walks early.

And what does he do when free, often in just a few days or weeks? He murders again. One study found that 10,000 Americans were murdered each year by murderers released from prison. Execution of the murderer certainly does lower the homicide rate if the murderer is executed instead of released.

Goertzel has done a fine job studying statistical facts on executions. But he has left out the realities of justice, recidivist murders, and prison murders. Statistics on executions give us no facts on murders and murderers which should be the core of any such study.

George Rowell
New York, New York

I believe that it is a mistake to dismiss econometric analysis itself as incapable of producing accurate analyses and conclusions. The explanation for the idiotic analyses described by Ted Goertzel is simpler: those researchers are incompetent.

The Ehrlich study is a case in point. Ehrlich had to use logarithms of the numbers of executions to reach his conclusion that each execution prevented nearly eight murders. This meant that each execution in the half-decade of fewer than five executions was weighed far more strongly than each execution in a half-decade of hundreds of executions. Using time intervals somewhat different from his (1933–1961 instead of 1933–1968), but following his analysis, others got dramatically different results. (Namely, the opposite sign.) Ehrlich did not provide any uncertainty or standard deviation for his result nor any indication of the goodness of fit.

Finally, Ehrlich dismissed all the concerns expressed, calling the different time intervals "meaningless" among other things.

I believe that the idea of cross-correlating murders with executions and other economic and sociological factors is valid. It simply has to be done competently.

John H. Morrison
Houston, Texas

I found Ted Goertzel's article on capital punishment to be quite a disappointment.

As a start, I interpreted figure 1 differently from Goertzel. What I see is Texas (a high execution state) having a generally higher murder rate than New York or California until the late 1980s and then dropping a few percentage points to approximately the same level as the other, apparently low-execution states. I would find it difficult on the basis of this figure to exclude the possibility that there was an impact of the death penalty on murder rates. No doubt, this drop might be explained by some exogenous event, but doing so gives Goertzel's apparently favored mode of analysis a bit of an ad hoc flavor. How do we know that a similar exogenous event occurred in one of the other states without an apparent effect on the murder rate?

Figure 3 is misleading in at least two different ways. To show that Texas is an outlier, Goertzel somehow randomly chose to present what turns out to be an unusual year for executions in Texas. In 2000, nearly one seventh (forty out of 289) of the total number of executions in Texas (since 1970) occurred. Would Texas have appeared to be such an outlier in a more average year in which say approximately nine executions occurred? In addition, Goertzel chose a population-normalized variable for the Y-axis (the homicide rate per 100,000 people) and yet leaves the variable on the X-axis (the total number of executions) not normalized by population (or anything related to the population). One could be forgiven for suspecting that this particular data array for this particular year was a statistical outlier, something Goertzel cautions readers against relying on elsewhere in his article.

While I am not completely sanguine about all uses of econometrics in this area, I am equally uncertain about solely relying on Goertzel's method of looking at "tables, graphs, and charts" as if they were a Rorschach ink blot to be interpreted by the experts.

As a long-time subscriber, it baffles me why the editors of this magazine would choose to take sides by presenting only one side of what is essentially a methodological dispute among social scientists.

Wayne R. Dunham, Ph.D.
Alexandria, Virginia

The article "Capital Punishment and Homicide" presents data purporting to show that the death penalty is ineffective as a deterrent to murder. Its exhibit A is a comparison of three states for the period 1982 through 2002, during which Texas executed 239, California 10, and New York none, with Texas actually having a somewhat higher homicide rate during that part of the period. There were, during the specified time interval, slightly more than 39,500 murders in Texas, hence one execution for each 165 murders. This provides no basis for any conclusions about deterrence; a penalty that is very rarely imposed cannot be expected to have a significant effect. If, for a comparable period of time, Texas were to execute one of every two murderers, the results might be quite different. But this must remain in the realm of conjecture because the experiment will not be tried.

David A. Shotwell
Alpine, Texas

One article was dubious, but giving Ted Goertzel a second chance to push his pseudoscientific objections to econometrics is just out of here. The simple point is that Goertzel is sponsoring inadequate and

outdated methods. And he uses them to draw the conclusions he likes.

Consider figure 1, which Goertzel calls typical of charts showing that the death penalty has no effect. In fact, the chart merely shows there are other factors besides the death penalty that affect the homicide rate, presumably some of them more important than the death penalty. In addition, there are at least two easy ways of reading the chart that support an effect at least as large as claimed by proponents of the death penalty.

Texas started the period with a sharply higher homicide rate than the states with little or no use of the death penalty. Its rate falls faster than the others at about the time the death penalty started to bite and ends with the same rate as the others. Obvious conclusion: The death penalty made a major difference and is saving roughly 500 lives a year in Texas.

Pushing the data a bit, we find a rising rate in the 1970s when there was effectively no death penalty and a falling one once it was restored.

Goertzel feels this shows the effect of other forces, but killers are on average dumb, stupid, and poor, in other words, quite possibly not sure if their state has a death penalty or not. So executions in Texas might lower homicides in California, and nearly all of the variation over time can be blamed on the death penalty.

These and other readings can be challenged, but the basic point is this chart is too simplistic to support the conclusion Goertzel wants.

David Argall
La Puente, California

For forty-five years, I have looked into capital punishment (CP). It was the subject of the main project for my Master's degree, which looked specifically at CP in regard to minors and the retarded. Aside from Japan, the U.S. is the only industrialized country with CP, and the only country executing minors, period, according to the latest information I have found.

A 1967 study by the UN concluded that nowhere they looked did the abolition of CP increase the crime rate, nor did its adoption decrease the crime rate. Another consideration is the idea of "suicide by homicide," in which non-entities such as Oswald, Gilmore, and McVeigh commit awful crimes *in order to be executed.* Suddenly, their vacant lives have meaning and fame. Finally, comes desired oblivion. Deterrence depends not on the severity of the consequences but the certainty. Almost no one commits a crime thinking to get caught.

Author-attorney Scott Turow recently published *Ultimate Punishment: A Lawyer's Reflections on the Death Penalty.* Before serving on the Illinois Commission investigating CP for Governor Ryan, Turow was pro. Afterwards, he voted "no" on the proposal to keep CP in the state. Radelet, Bedau, and Putnam's *In Spite of Innocence* lists four hundred Americans wrongly convicted of capital crimes they did not commit. A number were executed.

Between 1977 and 2004, California has had ten executions (*World Almanac 2004*, p. 155). Texas had 289 in the same period. If CP worked, Texas would have a vastly lower murder rate than California, yet they are almost exactly the same: 6.4 per 100,000 for California and 6.2 for Texas.

Leaving aside the costs for a capital trial (usually two to five million dollars), California taxpayers shell out $90 million yearly to keep the CP mechanism in place, used or not. Executions were reinstated in 1977. In the twenty-seven years since (again, trial costs aside), California has paid $2,430,000,000 to maintain this barbarity. That comes to $240,300,000 per execution.

Dana (Chris) Clarke
Santa Rosa, California

The question of capital punishment and its deterrence of homicide is knottier than Ted Goertzel thinks. Take the chart he presents of the murder rate in three states from 1970 to 2002. In the years when few or no executions were carried out in Texas—only four between 1974 and 1984—the murder rate there balloons substantially above New York and California. (See www.txexecutions.org/stats.asp.) Then, as the execution rate in Texas picks up in the late 1980s and 1990s, the Texas murder rate becomes about the same as the other two states.

Thus, it would appear that Texas, having a "natural" murder rate higher than New York or California for sociological reasons, has managed to lower it by means of capital punishment.

Taras Wolansky
Kerhonkson, New York

Statistics, schmatistics. Can anyone really believe that an about-to-be murderer with raised knife or poised trigger finger would engage in the following thought sequence?

"Let's see now. Shall I kill this person or not? If I should get caught, be tried, and found guilty, will the sentence be prison or execution?"

Even the likelihood of being caught is rarely if ever in the mind of a murderer at such a heated moment, much less the full train of thought leading to the two alternative consequences.

With regard to the *ceteris paribus* arguments, my experience, both in science and in life in general, has led me to formulate Wolke's Law of Pervasive Perversity: "All other things are never equal."

Nevertheless, I have no doubt that capital punishment can be a most effective deterrent to homicide, but only if properly applied: before the murderer acts.

Robert L. Wolke
Professor emeritus of chemistry,
University of Pittsburgh
Pittsburgh, Pennsylvania

All of the research on the relationship between capital punishment and homicide in the U.S. and other Western nations that ignores the primary psychological law governing learning is bound to show capital punishment as having no significant effect on the behavior of others.

Given that capital punishment in the U.S. occurs from fifteen to twenty years after the sentence, which often occurs some five years after the act of homicide, expecting some effect from execution is ludicrous.

The law I refer to holds true for many living creatures, not just for humans. It is the law that says that the learning or modified behavior depends on the immediacy of the reward or punishment! It also governs the behavior of those who are aware of the immediacy of punishment should they contemplate committing the criminal act.

Although I have been unable to gather any relevant data on the country of my residence for two years in the mid-1970s, I would bet that evidence could be found there to support the positive effects of punishment. I lived in Saudi Arabia (Dhahran) and was well aware of the extremely low incidence of murder and theft. Many of the punishments that are held in public view there (chopping off a hand or beheading, for example) occurred only a relatively short period after the criminal act.

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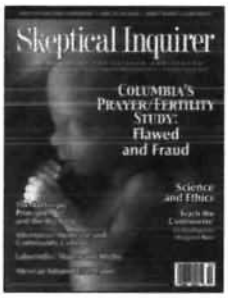

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Sample journal-article entry:

Smith, John, Jane Jones, and J.T. Thompson. 2001. A skeptical article. *The Journal* 5 (1): 7–12.

Use endnotes (not footnotes) for explaining or amplifying discussions in the text.

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Given our legal system in the U.S., it is not likely that the conditions for testing the effects of punishments that occur consistent with this law of immediacy will ever be available.

James Lee
Professor Emeritus
Ohio University
Athens, Ohio

Years ago, a medical examiner on the witness stand was asked by a defense attorney if there was really any value in capital punishment.

The M.E. responded, "Yes. It prevents the prisoner from murdering other victims."

Pat Leonard
Private investigator/
Security consultant
Braintree, Massachusetts

As a skeptic, I would like to make several comments about capital punishment. First, it is irrational to think a person who is going to commit a capital offense is going to consider the penalty of the crime before committing the act. In my opinion, one of the biggest mistakes rational people make is to believe others are thinking the same way they do. That may or may not be true. Second, capital punishment deters the recipient from ever committing another crime. The recipient will never be released from jail. There are cases where people who have a life sentence have killed other people, have escaped from jail, and have been released from prison. Third, I don't know anyone who favors executing innocent people. I also don't favor imprisonment of innocent people or arresting innocent people or trying innocent people, etc. The problem is not the punishment but the legal system. That a punishment doesn't deter a crime is no reason to get rid of the punishment. Our prisons are full of people who were not deterred, but no one favors getting rid of our criminal legal system.

There are people in our society who forfeit the right to live freely in society again. The question for or against capital punishment in my view is: What is the least expensive way of managing these people?

Rodney Crislip
Portland, Oregon

Ted Goertzel, in his article on capital punishment, commits the same error he accuses the pro-death-penalty people of committing. He tries to raise a straw-man argument that the pros are wrong and thus tries to make the anti-death-penalty people right. Goertzel uses a lot of column inches showing the economics-based statistical studies of capital punishment working are wrong, thus trying to leave the impression that capital punishment is ineffective.

Both Goertzel and the economic studies were disconnected from reality. First of all, in the literal sense, the death penalty is the ultimate deterrent—an executed person is definitely deterred from killing again. This is not a trivial point.

I mention this because government statistics show that past murderers are about 100 times more likely to murder again compared to the chances of an ordinary citizen murdering for the first time. "Life in prison without the possibility of parole" does not work. This means that an un-executed murderer will kill a fellow prisoner or guard, escape, or be pardoned. I have files of murderers who did all the above. Further, it is not far-fetched to talk about murderers getting loose again. . . .

Finally, it is common knowledge among police officers that robbers have told them that they did not kill their victims because they did not want to make a capital crime out of it. Let's not remove that deterrent, since even one life saved is good.

C. Norman Winningstad
Newport, Oregon

Ted Goertzel responds:

My article was on the scientific question of whether capital punishment reduces homicide rates, not on the ethics of capital punishment. On ethical grounds, I would oppose capital punishment, even if it could be shown to cut homicide rates, unless I could be completely assured that innocent people would never be executed. But the risk of innocent people being executed was not the topic of my paper.

The topic I did address was whether the use of capital punishment can be shown to affect the murder rate in a state or country. (The murder rate is the number of murders per 100,000 people.) This kind of question cannot be answered with anecdotal data or philosophical observations. Of course it is true that an individual (innocent or guilty) who is executed will never kill anyone (again). But it could be that his or her execution would stimulate someone else to kill or that it would contribute to a culture of violence that would lead to an increasing homicide rate. There are also people who wish to die and who may choose to commit "suicide by police." Certainly, no one would expect the death penalty to cut suicide bombings! But these kinds of arguments cancel each other out, and we have no good measure of how often each of them applies. To answer the question about homicide rates, there is no alternative but to use statistical data, limited though it is.

Many well-qualified researchers have done their best with the available data. These researchers are not incompetent; most of them are distinguished professors at leading universities, and they often publish in prestigious, peer-reviewed scientific journals. The problem is that many of them are like the boy who gets a new hammer and finds that everything around him needs pounding. They apply econometric methods to everything, even when those methods do not work for reasons that I explained in my article. The available data are too skimpy and do not fit the assumptions for multivariate statistical analysis.

The approach that does fit the data is to use graphs and charts such as those in my article. The beauty of this approach is that people can see the data for what it is and draw their own conclusions. The charts and graphs I presented were typical and were not selected to prove a point. I used the most recent data available at the time when I made them. It is true that one can look at the trends in Texas and see different possible explanations for them, as Wayne Dunham does. But none of these possibilities can be demonstrated, they are just possibilities.

Of course, as some readers point out, it is possible that a much higher execution rate, or a swifter imposition of the penalty, would have a different effect. But the countries that do such things don't keep very good statistics. Saudi Arabia, which imposes drastic penalties for all kinds of crimes, has recently suffered a sharp increase in crime, according to journalistic reports. But no reliable homicide-rate statistics seem to be available.

To reach a responsible conclusion on an issue such as capital punishment and homicide rates, one has to look at all the data that are available, not just at the few illustrative charts I put in my paper. There are excellent books by researchers who have done that, and they agree that no effect of capital punishment on homicide rates can be shown. It is only when researchers apply very complex econometric equations to the data that we find widely varying conclusions. Econometric methods may be more complex and sophisticated than the old-fashioned charts, tables, and graphs, but they have consistently failed to resolve causal issues about social problems. Unfortunately, some researchers

continue to use those methods as if they do offer such resolutions, and their findings are used in public-policy debates. For this reason, I thought it important to bring this issue to the wider public.

A New Ally for Science and Skepticism?

The last two issues of SI have included several articles that push far beyond the usual case studies. This is a trend that has been developing over the last few years, and I heartily applaud it.

In particular, Susan Haack's article ("Defending Science—Within Reason," July/August 2004) takes a very sophisticated view which recognizes that scientific facts are produced by practitioners in interaction with one another. As such, they are not merely picked up from nature like flowers.

As skeptics scan the horizon for allies in the various battles against pseudoscience, they may well want to look in some places which have not seemed obvious before. For example, Haack identifies Bruno Latour as one of the "New Cynics" who denigrate scientific fact building. Latour's work in the past could well be characterized in this way, but he has had a change of heart.

The April 2004 issue of *Harper's* magazine contains a reprint of a recent article by Latour,* in which his position seems to ally him with the skeptical community—at least as it is embodied by SI readers.

Latour writes that scientific facts are socially constructed but cannot be explained away as mere products of that process. We are definitely in the kind of dialogue about epistemology which—as Haack notes—"clears rooms," but need to stay in the room a bit longer. Latour states that "critical thinkers" of his ilk have attacked scientific facts with all of the tools at their disposal and "the black boxes of science remained closed . . . it was rather the tools that lay in the dust of our workshop. . . . Put simply, critique is useless against objects of some solidarity."

Latour has written this manifesto because he has seen how his old style of criticism can be used to obscure facts rather than to illuminate them. His prime example is the fact of global warming and the way this "fact" has been undermined for political purposes. He quotes one political strategist who seems to admit that the public *is ready to accept the scientific consensus* and, "Therefore, you need to continue to make the lack of scientific certainty a primary issue."

Bruno says, "I intended to emancipate the public from prematurely naturalized objective facts," but now he sees his techniques being used to "fool the public by obscuring the certainty of closed argument[s]."

This statement sounds exactly like the *numerous SI critiques of arguments offered* by anti-evolutionists.

Latour's writing may be tough to follow for skeptics unfamiliar with it, but it may be well worth the effort if doing so will help them to discover a new ally.

Jim Mica
Ithaca, New York

*Originally published as "Why Has Critique Run Out of Steam" in the winter issue of *Critical Inquiry*. It is available online at www.uchicago.edu/research/jnl-crit-inq/issues/v30/30n2.Latour.html.

Susan Haack responds:

Let me first clear up a misunderstanding. In my article I stressed the complicated interactions that enable division of scientific labor and pooling of scientific evidence, and I acknowledged that science both affects, and is affected by, other social institutions. But I didn't say, as Mr. Mica says—I don't believe—that "scientific facts are produced by practitioners in interaction with each other."

As Mr. Mica acknowledges, Bruno Latour's radical social-constructivist ethnomethodology of science, and his denial that there are objective facts to be discovered or objectively better and worse evidence of what those facts are, placed him firmly in the camp of the New Cynics. This work of Latour's is criticized in detail in chapter 7 of the book from which my article was excerpted (Defending Science—Within Reason: Between Scientism and Cynicism, *Prometheus, 2003).*

In the recent paper to which Mr. Mica refers, published after my book, Latour appears to admit that he formerly went too far (I say "appears," because Latour has long baffled careful readers by his willingness to say incompatible things, sometimes on the same page, without explanation or apology). But even now, Latour conflates "global warming is a fact" and "global warming is no longer a matter of scientific controversy." And whatever the truth about global warming may be, his paper contributes nothing to our understanding of the methods of science or the evidence for scientific claims. Perhaps it is M. Latour who has run out of steam!

Brain 'Design'? Not!

I happen to be a neuroscientist, but it doesn't take one to respond to April Pedersen's challenge to point out flaws in the human brain (Letters, "Brain Design?" July/August 2004). Any reader of SI knows how easily the brain is fooled by sleight of hand, illusions, and faulty reasoning. The fact that human brains under stress often produce inhuman behaviors also indicates that our brains were not specially designed for our species but evolved by elaboration of the brains of ancestral species that resorted to panic, rage, and cruelty rather than reason for their survival. It is true that we still understand relatively little about how the brain develops and produces behaviors, thoughts, and consciousness, but to conclude therefore that it must have been designed is simply to argue from ignorance. I would also note that the brain does not satisfy Behe's criterion of irreducible complexity, since it often continues to function amazingly well after large parts of it have been destroyed by stroke.

Let us suppose, however, that the brain really is the result of intelligent design. Since every intelligent design we know of has been produced by a brain, the Intelligent Designer must have had one, or something at least as complex. Who designed it?

C. Leon Harris
Adamant, Vermont

The brain designed? You must be joking!

The brain is full of design faults the solutions of which are to be found in other organs and tissues of the body.

Take its lousy blood supply. Dumbest of all, each vessel is an "end artery." That means that it and it alone supplies a specific region of the brain. If the vessel gets blocked, that region dies, because there is no alternative supply. This does not occur in, for example, the uterus, which is supplied by two major arteries, the ovarian and the uterine artery, either of which can be blocked with little ischaemic effect. Who would design the venous drainage of the nose and orbit to go directly into the cerebral sinus, when it would have been quite simple to have a vein run alongside the facial artery into the neck—thus eliminating the risk of direct infection into the meninges.

The "design" of the circulation of the cerebrospinal fluid that fills the brain cavities and surrounds the brain beggars belief. Nearly all the fluid has to pass through the minute canal joining the third to the forth

ventricles. If it gets blocked, there is a disastrous rise in intracerebral pressure. There is not even a sensor to detect this rise in pressure and switch off the secretion nor a relief valve to shed the excess fluid. Most other secretory organs have much larger ducts and after acute distension switch off the secretory phase. Why oh why "design" an organ that is so vulnerable to metabolic deprivation that a couple of minutes without oxygen will kill it. Yet fibroblasts can exist for days after death. Then again, whose daft idea was it to make the brain out of neurones that don't regenerate (as the liver does)? As is well known from the story of Prometheus, the first CSICOP investigator, who stole fire from the gods so that he could de-deify its properties, his punishment was to have his liver pecked out daily, only to have it regenerate at night, ready for the next day's pecking. In reality, it is not quite that good, but it is infinitely better than the brain.

Why incorporate a minuscule amount of plasticity that is insignificant when considering recovery from clinically significant insults? Bones, for example, can repair and remodel following massive injury.

Then, when you "know" as the "designer of all things" the risks, why concentrate nearly all the incoming and outgoing nerve fibres in the tiny medulla such that if it gets damaged, the damage is maximized. Surely, it would have been better to spread them out over a larger area like the drainage ducts within the kidney.

Why make the stupid thing so big at birth that its passage down the birth canal is painful and can be hazardous both to the mother and the infant?

Can you really believe a designer would make the straight sinus rigid by incorporating it into the junction of the rigid fibrous falyx and the tentorium and then be incompetent enough to join the loose great vein to it? Such that, if there is a sudden pressure change as the head leaves the birth canal, this junction is vulnerable to traumatic rupture and the bleeding causes irreparable spasticity.

The brain of the human is indeed the latest product of a long series of evolutionary changes. A chain of random mutations, some good, some awful, which have been cobbled together and have survived as the best of the brains so far. How much better it would be if we could redesign it. Oh, what a dream!

Noel Dilly
Alresford, Essex
United Kingdom
noel@pndilly.fsnet.co.uk

According to April Pedersen, the existence of human brains suggests intelligent design because scientists have not been able to design "even a simple life form." She also suggests that human brains "should humble evolutionists."

Her logic is unclear to me. If she is suggesting that intelligent design be invoked whenever scientists have not yet been able to design a natural object, there's nothing special about the human brain. For example, would she invoke intelligent design when considering the existence of the liver or a cricket brain because scientists can't design them, given the current level of technological sophistication? Why the human brain?

What about a molecule too complex to construct with our current technology? She goes on to say, "A person doesn't have to believe that the guiding hand of a Creator made life in order to appreciate the design in all living things." But why does she shy away from the notion of a Creator? Whose guiding hand would she suggest we invoke?

Lastly, just because something has the "appearance" of design does not mean it is designed. The sun appears to literally rise in the sky in the morning and plummet in the evening. The beautiful symmetrical snowflake may appear to be designed, but we need not invoke an intelligent designer for the snowflake.

April happens to be a member of my discussion group http://groups.yahoo.com/group/CliffordPickover/ in which we discuss topics in the SKEPTICAL INQUIRER. I invite readers to participate.

Clifford A. Pickover
Yorktown Heights, New York

It's astonishing that April Pedersen needs someone to "point out some flaws in the human brain." And it doesn't take "[n]euroscientists among our readers" to respond. To name just a few, try: susceptibility to several types of cancers, tumors, aneurysms, and associated strokes, to viral and bacterial encephalitis, to the deteriorations of Alzheimer's disease, Parkinson's disease, and related disorders, and to functional and neurochemical mental disorders of neuroses and psychoses.

What's so "wondrous" about that "design?" It looks rather like the designer was either absent-minded or got bored with the project and said, "Well, that's good enough." But it seems much more reasonable that, in the development of its current positive assets, the human brain carried along some negative evolutionary components—just as is the case with other body organs.

Her argument that scientists haven't produced "life from non-living matter" is fallacious reasoning—the fallacy of irrelevant conclusion. Even if that observation might apply to some other discussion, it has nothing to do with whether brains are supernaturally designed or the result of natural processes. It's just another sad example of imperfect brain function.

Jerry Caplin
Gaithersburg, Maryland

While the brain may well be the most complex organ on Earth (I don't know about the universe), its wondrous design confirms biological evolution in exactly the same way the design of other organs do.

The brain, like other organs, is not the result of intelligent design. If it were, the designer left much to be desired. Unfortunately, the brain does not always develop properly, and anomalous arterial flow, cerebral-spinal drainage, and anatomical development are the result. In addition, the brain is susceptible to many other diseases including cancer, Alzheimer's, Parkinsons, atherosclerosis, and depression. The "design" of the brain makes medical and surgical treatment difficult. The brain is prone to malfunction, resulting in many terrible mental diseases that plague humanity. Another tragic design flaw of the brain is that it is too easily fooled, manipulated, blinded, and implanted with false beliefs. On the positive side, April, the brain (mind) is capable of reason and change. It is possible for the conscious mind to avoid action based solely upon emotion and tradition. It can do wondrous things if superstition and ignorance do not hamper it.

Craig Gosling
Indianapolis, Indiana

Actually, the flaws in the brain dwarf any other physical flaws (appendixes, difficult births, etc.) that our bodies have. They, in fact, could mean our extinction.

We are neither creatures of pure instinct, like the rest of the animal kingdom, nor are we solely ruled by logic, like a computer. Rather, we are trapped in the middle of a deadly duel between our brain stem, the seat of our most primitive instincts and involuntary actions (what Carl Sagan called our "reptile brain") and, in the other corner, our cerebrum, the seat of reason and logic.

As all skeptics know, trying to separate

the two is extremely difficult. Just ask any dieter, who's primal instincts tell him to gobble down that chocolate cake (because we evolved in an environment where sweets were scarce), but who's forebrain insists that a cake-free diet is more important.

It is when other instincts come into play—aggression, tribalism, territoriality—that this dichotomy becomes deadly. Our instincts drive us to illogical acts of violence and discrimination, and we use our ability to reason, not to question these acts but to rationalize them. As Schopenhauer wrote, "We do not want a thing because we reason for it, we reason for a thing because we want it."

Kevin Trantow
North Hollywood, California

I am not a neuroscientist but a history professor. However, I was also diagnosed with clinical depression more than twenty years ago, and have gone through some very rough, painful, and at times, suicidal episodes. I would imagine that the millions of people with similar problems, or others, such as those with autism, learning disabilities, bipolar troubles, or even potentially worse troubles, such as schizophrenia, could point out to Pedersen that yes, there seems to be quite a bit of evidence that brains can be flawed, enough that some of them should be sent back to the "designer" for warranty replacement.

On another, related note, I personally don't care for the usage of the term *design* with regard to anything natural, organic or otherwise, because the implication is the existence of a designer. I don't even like to refer to the "laws of physics," because again, there is an implication of a law giver. "Principles of physics" seems more neutral.

Darlene Hall
Painesville, Ohio

A neuroscientist I am not, but I gleefully accept the challenge thrown out by April Pedersen to point out flaws in the human brain. I am one of those unfortunates whose eyesight is fine for any distance over eighteen inches, but require glasses for reading. In common with, I have no doubt, millions of other literate people, I spend a substantial portion of my waking hours attempting to divine where it was that I laid my glasses down the last time—i.e., when I stopped reading and the glasses changed from a necessary tool to a nuisance.

Obviously, any brain with the perfection that April claims for the human one would automatically note where the glasses were placed and be ready at a moment's notice to advise its owner where to find them. Instead, one finds one's mind a total blank for the time interval involved, and this "most superbly structured organ in the known universe," as April calls it, is reduced to the pathetic function of ordering the vocal chords to repeat endlessly to one's wife and/or children, "Has anybody seen my glasses?"

An amazing organ the brain is, but perfect it is not!

Gerald J. Cavanaugh
Cincinnati, Ohio

Fabric of the Cosmos

I read with interest James Gardner's review of *The Fabric of the Cosmos* by Brian Greene (July/August 2004). It was an excellent review of the book and of the current state of M-theory. However, I found it hard to identify with the apparent angst prevalent among cosmology researchers.

What is the problem with explaining our presence in the universe by a combination of chaotic fluctuation and the weak anthropic principle? Sounds like an entirely satisfactory explanation to me. Gardner thinks that researchers are bothered by this explanation, desiring instead to discover that the math inexorably leads to a universe such as ours, welcoming life with open arms. Why would such a result be any more appealing than the wild chance results of chaotic fluctuation? It sounds as if there is an implicit assumption about some sort of causal factor behind the miraculous math. Are physicists looking for God in there somewhere?

If people are satisfied with the chance results of evolution, I don't see why they shouldn't be comfortable with the chance results of chaotic fluctuation. And who knows, maybe some of those other 10^{500} outcomes harbor clever forms of life too. Do we think we truly understand what it means to tweak the cosmological constants?

Paul C. Anagnostopoulos
Carlisle, Massachusetts

James Gardner's critique of Brian Greene's book *The Fabric of the Cosmos* has the merit of deflating premature celebration of a fundamental theory, but it also does Greene an injustice by not mentioning the attractive features of M-theory. It is at present the only theory that provides a cogent *physical* explanation for all the bizarre features of fundamental particles, such as what spin and charm actually are, why antiparticles exist, and so on. Yes, it reveals that the model can be shaped in countless different ways, leaving the question of origins unexplained—but it is quite something that no one else has come up with any physical model that can make so much sense as Superstring theory of the way things actually *are*. That is why physicists like Greene are so obsessed with it. It is hard to deny that they might be on to something. Just exactly what remains to be seen—Gardner is right about that, since knowing *why* things are the way they are doesn't necessarily tell us how they got that way—but I think that point could have been made in a single paragraph, rather than two whole pages of scorn.

Richard C. Carrier
Columbia University
New York, New York

Pascal's Wager

In a letter (July/August 2004), Lynn R. Heath cites Pascal's wager as a partial justification for religious belief, stating, "it's better to bet there is a God, since if I am wrong I've lost little, but if I'm right I've gained a great deal." Alas, no; there is the problem of choosing among competing gods. For example, God actually may be the God of the Qur'an, who may be offended by belief in the God of the Bible, or vice versa. Moreover, the true God may not be among those recognized by the organized religions. Consider the following possibility:

There is a God, but He has provided no certain evidence for what He is like, even for whether He exists. He expects us to recognize this fact, punishing those who presume to know about Him when they really do not while rewarding those who frankly admit their ignorance. So only the agnostics are saved!

John G. Fletcher
Livermore, California

Lynn Heath says that Pascal's wager represents one of the reasons she believes in God. "In the game of life, it's better to bet there is a God, since if I am wrong I've lost little. . . ." Ah—but what if you've chosen the wrong god for your wager? My wager—equally valid I think—is: "I've rejected all the hundreds of gods different people have said

exist. So if there were a god, I'd have rejected all his, or her, rivals and avoided the risk of worshiping a false one."

Paul Fairburn
Solihull, England

Knowledge about Nature

I appreciate Peter Marston taking the trouble to respond ("Sources of Knowledge," Letters, SI July/August) to my earlier letter asking for methods of inquiry about the world other than science.

He suggested two: argument and rhetoric. By the world, I meant the natural world, or nature. I trust that Marston doesn't think his suggestions tell us anything about nature, but if he does, a specific example of each would be helpful.

Curiously, he places scientific inquiry on a much higher pedestal than I would. I can't buy his claim that scientific logic allows us to develop inferences that can be known with certainty. To my mind, all scientific knowledge is tentative and must remain so no matter how reliable some of it has become.

Don Keith
Waterloo, Ontario
Canada

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A Day in the Lives of Galaxies

Like a photographer clicking random snapshots of a crowd of people, NASA's Hubble Space Telescope has taken a view of an eclectic mix of galaxies. In taking this picture, Hubble's Advanced Camera for Surveys was not looking at any particular target. The camera was taking a picture of a typical patch of sky, while Hubble's infrared camera was viewing a target in an adjacent galaxy-rich region.

Image Credit: NASA, ESA, J. Blakeslee and H. Ford (Johns Hopkins University)

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